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Head Office—British Museum (Natural History), Cromwell Road, London, S.W.7.

Publication Office—41, Queen's Gate, London, S.W.7.

[Lazarov' (A. V.).] **Лазаровъ (А. В.). Die Fritfliege, *Oscinis frit*, L. (Dipt., Oscinidae) als Schädling der Getreidepflanzen in Bulgarien und die Bekämpfungsmassnahmen.** [*O. frit*, L., as a Pest of Cereal Plants in Bulgaria and Measures for controlling it.] [*In Bulgarian.*]—59 pp., 7 figs., 1 diagr., 125 refs. Sofia, Minist. Volksw. PflSchDienst, 1935. (With a Summary in German.)

A detailed account is given of the bionomics of *Oscinella* (*Oscinis*) *frit*, L., in Bulgaria, based on field and laboratory observations in the valley of Sofia in 1929–31 and 1934, supported by, and compared with, data from the literature. The systematic position and synonymy of the fly are discussed, and all stages are described. Of the cereals cultivated in Bulgaria, spring sown oats are the most readily attacked, but autumn and spring sown wheat, spring sown barley and autumn sown rye, and occasionally maize are also infested. In the valley of Sofia the loss of crop sustained is normally about 3 per cent., but is often as high as 15 per cent.; in other districts losses of 20–50 per cent. are not unusual. The reduction in weight of grain from infested plants may be as great as 82 per cent. in barley and 65 per cent. in oats. *Phalaris arundinacea*, *Festuca* spp., *Agrostis alba* and probably other grasses are also infested.

The fly is widely distributed and occurs up to an altitude of about 2,840 ft. It has three generations a year, the larvae of the third hibernating. The adults begin to emerge in the second half of April and occur for about 3 weeks, though some of them live longer. The eggs, which are usually laid at the base of spring sown oats and barley and only occasionally on autumn sown wheat, hatch in 3–4 days. The larval and pupal stages last about 4 and 2 weeks, respectively. The adults of the first generation are on the wing from mid-June, at the time of formation of ears of oats and of spring sown barley and wheat. Eggs are laid chiefly on the ears and also on the young side shoots, chiefly of oats. The egg, larval and pupal stages of the second generation last about 3, 22–25 and 12 days. The adults occur from early August to mid-October. Their eggs are laid on self-sown and early sown winter wheat and rye, and the larvae hatch in 4–5 days and hibernate. The only parasites so far found in Bulgaria are the Cynipid, *Eucoila* (*Rhoptromeris*) *eucera*, Htg., and the Pteromalid, *Callitula bicolor*, Spin., but the rate of parasitism is not known.

Investigations on the resistance of varieties of oats to infestation showed that the native ones suffer least. The only methods of control are agricultural measures, of which the following are recommended: Deep ploughing of self-sown cereals to destroy the third generation larvae; sowing resistant varieties of oats, or early maturing varieties that are well developed when the flies appear; improved cultivation and manuring to increase the resistance of the plants; and sowing summer cereals before 15th March, and winter ones after 1st October.

Schimitschek (E.). ***Dendromyza*-Larven als Korbweidenschädlinge. *Dendromyza cambii* Hendel (Agromyzidae); Die Weiden-Kambiumminierfliege.** [Larvae of *Dizygomyza* (*Dendromyza*) as Pests of Basket Willows. *D. cambii*, the Willow Cambium Mining Fly.]—*Anz. Schädlingsk.* **11** no. 11 pp. 121–126, 11 figs., 6 refs. Berlin, November 1935.

Basket willows in Austria were injured in 1934 and 1935 by *Dizygomyza* (*Dendromyza*) *cambii*, Hendel, the larva and pupa of

(130) Wt. P12/3603 1700 2/36 S.E.R. Ltd. Gp. 353. [A]

which are described. *Salix viminalis belgiae, S. viminalis regalis, S. americana* and wild willows were infested. The eggs are laid singly on healthy willow rods one or more years old, usually at a height of 12–16 inches. Most of them appear to be laid from mid-May to early June. The larvae mine the sapwood and cambium, and, rarely, the bark. The serpentine mines run downwards, sometimes to the roots, and may cross one another. Pupation, which usually occurs in the second half of July, or in early August at the latest, takes place in the ground at the foot of the plant, three fingers deep. The pupae hibernate, so that there is one generation a year. Prolonged flooding appears harmful to the pupae, for in 1935 willow beds that had been long under water at the end of May were less attacked than in 1934. The discoloured mines are always visible when the rods are peeled and so reduce their commercial value considerably. This applies also to injury by a poplar cambium miner, probably a different species, the mines of which are found on several annual rings in poplar stems when they are split open.

HAHMANN (K.). **Massenauftreten von** *Cneorrhinus plagiatus* **Schall.** [An Outbreak of *C. plagiatus*.]—*Anz. Schädlingsk.* **11** no. 11 pp. 126–128. Berlin, November 1935.

An outbreak of *Cneorrhinus plagiatus*, Schall., long known as a forest pest in Germany, occurred in the territory of Hamburg in 1932–1934, when the adults attacked all kinds of plants, especially beans, peas, cabbage, rhubarb and strawberry [*R.A.E.*, A **22** 213]. They reappeared in May 1935, rhubarb and strawberry plants being often almost completely destroyed. Collection at night, spraying with lead arsenate and dusting with proprietary pyrethrum insecticides were tried, but not in a concerted manner. In laboratory experiments lead arsenate was found to act as a repellent, while contact dust insecticides killed the weevils. The weevils were very sluggish at 12–15°C. [53·6–59°F.], but fairly active at higher temperatures. The number of eggs laid by a female was usually from 30 to 50.

DINGLER (M.). **Kurzes Nachwort zu meinen Arbeiten über die tierischen Spargelschädlinge.** [A short Supplement to my Papers on the Animal Pests of Asparagus.]—*Anz. Schädlingsk.* **11** no. 11 p. 131. Berlin, November 1935.

This is a list of the author's papers on the insect pests of asparagus in Germany arranged in the order they would occupy if the work had been published as a monograph [*R.A.E.*, A **22** 560; **23** 125; **22** 629, 725; **23** 138; **21** 272; **23** 85, 598; **21** 139].

[SAVCHENKO (E. N.) & MOKRZHITZKAYA (E. N.).] **Савченко (Е. Н.) и Мокржицкая (Е. Н.). Die Insekticiden-Eigenschaften des Nikotin-Sulphits in Vergleich mit einigen anderen Nikotin-Präparaten.** [The insecticidal Properties of Nicotine Sulphite in Comparison with some other Nicotine Preparations.] [*In Russian.*]—*Sborn. Rab. ent. Otd. VIMPa* [*Coll. Works ent. Sect. All-Un. Inst. Makhorka Industry*] pp. 6–30, 3 graphs, 28 refs. Kiev, 1935. (With a Summary in German.)

A detailed account is given of investigations in the Ukraine in 1932–33 on the toxicity to insects of solutions of nicotine sulphite

(the nicotine salt of sulphurous acid, which was first prepared in 1932). In laboratory tests, various Aphids, and larvae of *Hyponomeuta padellus malinellus*, Zell., and of the bug, *Pyrrhocoris apterus*, L., were immersed for 5 minutes in the various solutions by a method similar to that of Shepard and Richardson [*R.A.E.*, A **19** 681]. The nicotine sulphite proved more toxic than nicotine sulphate, nicotine chloride, nicotine naphthenate or anabasine sulphate, but slightly less so than anabasine naphthenate. The red coloured sample was more toxic than the yellow one, probably because it contained toxic resins of the makhorka plant (*Nicotiana rustica*). The effect of nicotine sulphite on the Aphids varied with the different species and forms ; the wingless females of the summer generations were the most resistant, and the larvae the least. *Myzus* (*Myzodes*) *persicae*, Sulz., which had been reared on makhorka for several generations, was the most resistant species, 100 per cent. mortality of the larvae requiring a 0·105 per cent. concentration of 40 per cent. nicotine sulphite, as compared with 0·040 and 0·053 per cent. concentrations for larvae of *Aphis sambuci*, L., and *A. fabae*, Scop., respectively. The mean lethal concentration for the various species of Aphids treated was 0·031 per cent. actual nicotine in the form of the sulphite as compared with 0·05 per cent. chemically pure nicotine. In field tests, which were made against *A. fabae* on beet, a mortality of 96–98 per cent. was only obtained with a 0·23–0·25 per cent. concentration of 40 per cent. nicotine sulphite.

Special experiments confirmed the higher toxicity of nicotine salts as compared with pure nicotine at equivalent concentrations [*cf.* **20** 197], and did not support the conclusions of de Ong [**12** 80] and Shepard & Richardson [**19** 681, etc.], whose work is critically reviewed. The mean percentages of mortality of Aphids treated with different nicotine salts and anabasine sulphate were 98 and 91, respectively, as compared with 77 and 85 for pure nicotine and anabasine. At concentrations equivalent by weight, however, nicotine or anabasine produced a slightly higher mortality than the salts.

The high toxicity of nicotine sulphite solutions may be explained by the complex action of the nicotine and of sulphur dioxide liberated during hydrolysis, and by such physical properties as high viscosity and low surface tension. The effect of these factors on the toxicity of the various nicotine and anabasine preparations is discussed, and the correlation is shown in graphs and formulae. It was found that with the increase in the toxicity of the preparation, the curve of viscosity showed a pronounced tendency to rise, whereas that of the surface tension dropped.

The toxicity of nicotine sulphite increases as the pH value rises, and it was, therefore, found possible to render the solutions more effective by adding such alkalies as ammonium, sodium and calcium hydroxides, and especially soft soap, which also improves the physical properties of the solution and introduces into it toxic fatty acids. In view of the expense of soft soap, it is recommended that Petrov's " Contact " or naphthene soaps [**20** 199, 202] should be substituted for it. In special laboratory experiments, in which different solutions of nicotine sulphite with or without the addition of soft soap, lime or sodium hydroxide were applied to various plants, including makhorka, the leaves were not injured ; in the field, very slight scorching only occurred once when soft soap was added to the solution.

[Savchenko (E. N.).] **Савченко (Е. Н.). Zur Frage des Einflusses der Insekticiden auf die *Nicotiana rustica* und Zigarrentabakpflanzen bei der Bespritzung der letzten.** [On the Influence of Insecticide Sprays on *N. rustica* and Cigar Tobacco Plants.] [*In Russian.*]—*Sborn. Rab. ent. Otd. VIMPa* [*Coll. Works ent. Sect. All-Un. Inst. Makhorka Industry*] pp. 31–69, many refs. Kiev, 1935.

Since tobacco and *Nicotiana rustica* (makhorka) are attacked by many pests in the Russian Union, including *Loxostege sticticalis*, L., *Barathra brassicae*, L., *Heliothis* (*Chloridea*) *dipsacea*, L., and *Tettigonia* spp., special field experiments were carried out in 1931 and 1932 to determine whether different insecticidal sprays would injure the foliage of the plants and affect the yield of the crop. A detailed account of them is given, and the results are shown in tables. Molasses was added as an adhesive to many of the sprays, and in the case of Paris green also served to stabilise the suspension. The arsenicals were mixed at the rate of 1 : 2 with lime to minimise scorching.

The following are the author's conclusions: Barium chloride scorches tobacco, and especially *N. rustica*, rather severely. For tobacco in the stage of 8–9 young leaves, a 3 per cent. concentration may be used; and 4 and 5 per cent. for more developed plants, before flowering and during the period of partial maturation. In the case of *N. rustica*, 3 per cent. (or 4 per cent. for plants grown for seed) is the maximum.

In the case of Paris green the concentrations are 0·15–0·25 per cent. for tobacco and 0·2 or less for *N. rustica*. Calcium arsenate was not tested on *N. rustica*, but caused only slight scorching of tobacco, and may be applied in 0·15–0·25 per cent. concentrations. Sodium arsenite is too injurious to be used. Sprays of 0·7–0·9 per cent. sodium fluosilicate on tobacco and 0·7 per cent. sodium fluoride on *N. rustica* may be applied; the tests of the fluosilicate on *N. rustica* and the fluoride on tobacco were inconclusive.

Nicotine sulphate (0·1–0·25 per cent. with 0·5–1·0 per cent. soft soap) did not scorch the plants at all. A combined spray of nicotine and Bordeaux mixture caused severe injury to *N. rustica* and gave inconclusive results on tobacco.

None of the insecticides, except sodium arsenite, affected the yield or nicotine content of the plants or the germination of the seed.

[Shelyuzhko (L. A.).] **Шелюжко (Л. А.). Uebersicht der Schädlingsinsekten der *Nicotiana rustica* und Zigarrentabakpflanzen.** [A Survey of Insect Pests of *N. rustica* and Cigar Tobacco Plants.] [*In Russian.*]—*Sborn. Rab. ent. Otd. VIMPa* [*Coll. Works ent. Sect. All-Un. Inst. Makhorka Industry*] pp. 70–97, 2 refs. Kiev, 1935.

As result of investigations carried out in 1932 in certain districts of the Departments of Poltava, Chernigov and Tambov, the Lower Volga Region and southern Kazakstan on insects attacking tobacco and *Nicotiana rustica* (makhorka), a list of the species found is given together with those previously observed in the Russian Union. It includes all the species that had already been noticed from Poltava [*R.A.E.*, A **19** 502], and the grasshopper, *Phaneroptera falcata*, Scop., the weevil, *Peritelus familiaris*, Boh., and the Tortricid, *Cnephasia*

wahlbomiana, L., all observed near Kiev, the last-named only on *N. rustica*. Notes are given on the distribution, abundance, importance and in some cases bionomics of the species observed in 1932. Of these, the most injurious were: *Tettigonia caudata*, Charp., and *Gryllotalpa gryllotalpa*, L., both in Poltava and Tambov; *Corymbites* (*Selatosomus*) *latus*, F., which represented 80–90 per cent. of all the Elaterids found in Poltava and Tambov and also caused serious damage in the Lower Volga Region; the weevil, *Tanymecus palliatus*, F., in Poltava; *Heliothis* (*Chloridea*) *dipsacea*, L., in the Lower Volga Region; *H.* (*C.*) *armigera*, Hb. (*obsoleta*, F.), which was abundant in southern Kazakstan; *Thrips tabaci*, Lind., particularly on *N. rustica* in Poltava about the end of August; and *Loxostege sticticalis*, L., the seasonal occurrence of which in various localities in Poltava, Chernigov and Tambov is discussed.

Stored seeds of *N. rustica* were attacked by *Tenebrio molitor*, L., *Tinea misella*, Zell., and *Ptinus fur*, L. All these occurred in small numbers only, and *Niptus hololeucus*, Fald., which was found with *P. fur*, was not proved to cause injury to the seeds. More damage was caused by mites (probably *Tyroglyphus* sp.), which were very abundant in stores of the seeds in the Kiev Department.

A list is appended of 97 species of Lepidoptera caught by means of molasses baits in the Poltava, Chernigov and Tambov Departments with a view to studying the phenology of the flight of Noctuids. It shows the dates and localities of capture, and in most cases the periods and peaks of the flights.

[Shelyuzhko (L. A.) & Mal'skaya (A. V.).] **Шелюжко (Л. А.) и Мальская (А. В.). Zur Frage der Desinsektion der** *Nicotiana rustica*-**Samen und des Einflusses der Beizmitteln auf ihre Keimfähigkeit.** [On the Question of the Treatment of the Seeds of *N. rustica* against Insects and the Effect of the Fumigants on their Germination.] [*In Russian.*]—*Sborn. Rab. ent. Otd. VIMPa* [*Coll. Works ent. Sect. All-Un. Inst. Makhorka Industry*] pp. 98–117, 1 fig., 15 graphs, 9 refs. Kiev, 1935. (With a Summary in German.)

As stored seeds of *Nicotiana rustica* (makhorka) are attacked by various pests in the Russian Union [see preceding abstract], experiments, a detailed account of which is given, were carried out in the Ukraine in 1931 and 1932 on the effect of fumigation with carbon bisulphide and chloropicrin on their germination. The fumigants were applied in glass jars with lids at a temperature of 21–23°C. [69·8–73·4°F.], and uninfested seeds were used, but in the tests with carbon bisulphide, mites were placed among them. Germination of seeds of normal humidity (up to 10 per cent.) was not affected by carbon bisulphide used at the rate of 15 oz. to 100 cu. ft. with exposures of from 6 hours to 6 days, or by chloropicrin at 2, 2½ and 5 oz. to 100 cu. ft. with exposures of from 10 hours to 5 days. When, however, the seeds were kept in the laboratory for 3 months after fumigation, those treated for 6 days with carbon bisulphide had their power of germination reduced by 19 per cent. All mites were killed by exposure for 6 hours. Seeds fumigated with chloropicrin at the rate of 2 oz. to 100 cu. ft. after their humidity had been increased to 15 per cent. showed sharp fluctuations in rate of germination under various periods of exposure, and, until more definite data are obtained, it is recommended to

bring the seeds to conditions of normal humidity (not exceeding 10 per cent.) before fumigating them.

In tests of the effect of chloropicrin on *Calandra granaria*, L., and the adults and larvae of *Tribolium confusum*, Duv., all the insects placed with seeds treated with 2 oz. to 100 cu. ft. were killed in 24 hours, whereas those in control jars were still alive on the sixth day.

[Ovcharenko (L. S.).] **Овчаренко (Л. С.). Einfluss der *Nicotiana rustica* als Futterpflanze auf die *Loxostege sticticalis* L. Raupen.** [The Effect of *N. rustica* as a Food-plant on the Larvae of *L. sticticalis*.] [*In Russian.*]—*Sborn. Rab. ent. Otd. VIMPa* [*Coll. Works ent. Sect. All-Un. Inst. Makhorka Industry*] pp. 118–121. Kiev, 1935.

A brief account is given of laboratory experiments in June 1932 in the Tambov Department on the possibility of *Loxostege sticticalis*, L., becoming a pest of *Nicotiana rustica*. All larvae placed on *N. rustica*, as soon as they hatched died in 1 or 2 days. Of 50 larvae fed on *Chenopodium* and *Polygonum* during the first instar and then on *N. rustica*, 37 died before entering the soil to pupate, and there were only 5 pupae, of which 3 gave rise to adults. Of 50 larvae transferred to *N. rustica* after completing 3 instars on these weeds, 49 entered the soil, 12 pupated, and 10 moths emerged. All the 50 larvae fed throughout their development on *Chenopodium* and *Polygonum* entered the soil, but only 12 pupated and 9 moths emerged. The unsuitability of *N. rustica* as a food-plant for the young larvae of *Loxostege* is confirmed by the fact that they were never found by the author on it in the field. It is possible that the dense hairs of the leaves prevent the larvae from reaching the tissues.

[Savchenko (E. N.) & Pal'chik (P. A.).] **Савченко (Е. Н.) и Пальчик (П. А.). Chlorpikrin (CCl_3NO_2) als Bekämpfungsmittel gegen die Drahtwürmer (Elateridae).** [Chloropicrin as a Control Measure against Wireworms.] [*In Russian.*]—*Sborn. Rab. ent. Otd. VIMPa* [*Coll. Works ent. Sect. All-Un. Inst. Makhorka Industry*] pp. 122–139, 1 fig., 15 refs. Kiev, 1935. (With a Summary in German.)

As wireworms often destroy 25–40 per cent. of the seedlings of *Nicotiana rustica* (makhorka) in some districts in the Russian Union, chloropicrin was tested for their control in 1932 near Kiev, and in 1933 in the Department of Poltava. Near Kiev the density of wireworms in the soil varied from 4 to 44 per sq. m. [10·76 sq. ft.], *Limonius aeruginosus*, Ol., and *Corymbites* (*Selatosomus*) *latus*, F., being the predominant species. In the Department of Poltava *C. latus* was practically the only species present and the maximum number of wireworms per sq. m. was 16. The plots were divided into squares varying in size from 0·12 to 0·5 sq. m., at the corners of which the chloropicrin was applied in small holes 4–10 ins. deep. The rate of application was 15–60 gm. per sq. m. Rates up to, and including, 30 gm. did not kill wireworms or other soil pests, irrespective of the depth and spacing of the holes. Rates of 40 and 50 gm. killed 66·5 and 97·2 per cent. of the wireworms respectively, and 60 gm. killed 100 per cent. in

15 cases out of 17. This dosage [which is equivalent to about 2 oz. per sq. ft.] may, therefore, be accepted as lethal. Whatever the variations in the depth and spacing of the holes, the wireworms were killed within 5 days.

When the holes were based on 0·12 and 0·25 sq. m., the 60 gm. application killed all or 90 per cent. of various weeds growing on the treated plots. To determine the effect of this rate of application on *N. rustica*, special experiments were carried out in 1933 in the Tambov Department. The depth of application was 6 ins. and the squares were 0·12, 0·16 or 0·25 sq. m. Seedlings of *N. rustica* were planted 14 days after fumigation. Irrespective of the spacing of the holes, all the plants within 20–25 cm. of them were killed. Plants at a greater distance showed retarded development but eventually recovered and produced a normal yield. The effect of chloropicrin on the plants is probably due to the fact that soon after it is applied the amount of nitrates in the soil decreases considerably, though it becomes normal again in about 6 weeks.

Plantsygdomme i Danmark [Plant Diseases and Pests in Denmark] **1934.**—*Tidsskr. Planteavl.* **40** pp. 713–772, 11 figs.; also as *Overs. St. Plantepat Forsøg* no. 51. Copenhagen, 1935. (With a Summary in English.)

Lists arranged by food-plants are given of pests observed in Denmark in 1934. Swedes were severely attacked by *Aphis fabae*, Scop., and *Brevicoryne brassicae*, L., and then by *Contarinia nasturtii*, Kieff. Cutworms were unusually numerous and destructive on field and garden crops, but were efficiently controlled by bran baits poisoned with cryolite. *Bibio hortulanus*, L., *B. ferruginatus*, L., and *Dilophus febrilis*, L. (*vulgaris*, Mg.) were common on barley in the spring, only a small percentage being parasitised by *Spilomicrus* sp. *Diarthronomyia hypogaea*, Lw., was found (for the first time in Denmark) on chrysanthemums in greenhouses and in the open at Copenhagen.

Report of the Fourth Imperial Entomological Conference 19th–27th September 1935.—Med. 8vo, 70 pp. London, Imp. Inst. Ent., 1935. Price 4*s*.

Among the resolutions passed at this Conference, which was attended by 27 delegates representing the various parts of the British Empire, were two the effect of which was to urge the importance of adequate support being given to the Imperial Institute of Entomology to enable it to continue its services along established lines and to extend its systematic work.

Details are given of the work of the Institute from April 1930 to March 1935 and of its annual expenditure. The discussions that took place at the scientific meetings of the Conference are summarised, the subjects dealt with being: Locusts and Grasshoppers; Termites; Cotton-stainers [*Dysdercus*] and their Control; Sheep Blowflies; The Biological Control of Insect Pests; Pests of stored Products; The need for Forest Entomologists, with special reference to the Pin-hole Borer Problem; and Plant Viruses and their Insect Vectors.

Barnes (H. F.). **Studies of Fluctuations in Insect Populations. IV. The Arabis Midge,** *Dasyneura arabis* **(Cecidomyidae).**—*J. Anim. Ecol.* **4** no. 1 pp. 119–126, 1 pl., 1 fig., 4 refs. Cambridge, May 1935. **V. The Leaf-curling Pear Midge,** *Dasyneura pyri* **(Cecidomyidae).**—*T.c.* no. 2 pp. 244–253, 1 fig., 6 refs. November 1935. **VI. Discussion on Results of Studies I–V.**—*Op. cit.* pp. 254–263, 15 refs.

These three papers belong to a series [*cf. R.A.E.*, A **23** 153, etc.]. *Dasyneura arabis* [*cf.* **15** 579; **21** 563], which attacks *Arabis albida* and was studied at Harpenden during 1928–34, is possibly identical with *D. schneideri*, Rübs., which was described in 1917 as causing similar damage to the same species of plant in Zurich, although it differs in one or two structural characters. The nature of the injury it causes to the plant and its bionomics are briefly described. Eighteen generations were bred in an outdoor insectary from the original material obtained from Surrey. The larvae feed inside the gall and pupate in it or in the soil. Relatively more males emerged from the soil than from the galls. The usual number of larvae and pupae found in one gall is 20–30. There are several generations a year, cocoons of the last two overwintering in the soil or on the plants. The larvae were attacked by a parasite, *Misocyclops marchali*, Kieff., and a predator, *Lestodiplosis* sp.

In 1930 and 1931 there were 3 broods a year and in 1929, 1932 and 1933 4 broods; the fourth brood did not emerge the same year as the eggs were laid. There would probably be considerable overlapping of the various generations in nature. The dates of emergence of the latter are shown in a table and chart. It was noticeable that the minor variations in the dates of emergence from year to year caused by differences in weather conditions became levelled out by the end of the year. In this species unisexual families are rare. More males were produced when fertilisation of the females was delayed until 24 and 48 hours after emergence. The ratio of males to females for the 5 years was 27 : 73. The sex ratios of the various broods were different; the percentage of males decreased as the season advanced.

For studying *Dasyneura pyri*, Bch., fresh material containing full-grown larvae of each brood was obtained from Devon and reared at Harpenden from 1927 to 1934. Its distribution and bionomics are briefly described. Up to about 35 eggs are laid on one pear leaf. The larval period of the summer generations lasts 2–5 weeks but varies considerably according to the weather. The larvae pupate in the soil or occasionally in the galls, and the adults emerge in 10–14 days. The last generation of the year, and some individuals of the penultimate and sometimes the antipenultimate ones remain as larvae in the soil throughout the winter and pupate shortly before the adults emerge in the following spring. There appear to be 3–4 generations a year and occasionally a very small fifth. In New Zealand 6 have been reported.

In addition to the parasites recorded from France [**16** 154], *Polygnotus* sp. and *Zatropis catalpae*, Cwfd., were found associated with *D. pyri* in the United States, and an undetermined bug attacks all stages of the latter there. In England, *Lestodiplosis pyri*, Barnes [**16** 426] attacks the larvae, and *Anthocoris nemorum*, L., is predacious on the larvae, pupae and adults. *Misocyclops marchali* has been recorded from *D. pyri* in 5 counties and has also been reared from

D. arabis and *D. ulmariae*, Bremi. Several inquiline midges, including species of *Clinodiplosis*, *Contarinia* and *Macrolabis*, were reared from the galls of *D. pyri*. No parasites of the midge were obtained in 1927–29 or from the first brood in any year, but *M. marchali* was reared from the second generation in 1930, 1931 and 1933 and parasitised most of the broods that overwintered as larvae between 1930 and 1934. It appears probable that the parasite has not yet adjusted itself to the life-cycle of the midge and develops more slowly, as the percentage parasitism varied very considerably, and the part of a midge brood that emerged in the same year as the eggs were laid was often free from parasites, though the part that emerged in the following year was attacked. Tables show the dates of emergence of the adults of each brood of *D. pyri* and the percentages emerging in the same and the following years during 1927–34. It was apparent that under certain conditions aestivation as well as hibernation of mature larvae occurs. The earliest date of emergence recorded was 11th April 1933 and the latest 15th October 1928. Although the dates of emergence of each brood in 1933 were all early, there were no more generations than in 1931 when all the corresponding dates were later. This is probably because the larvae live on the new growth and in the hot, dry season of 1933 there was not sufficient new growth to maintain extra broods. In New Zealand, the climate encourages prolonged growth of the pear trees, and extra broods develop. The numbers of males and females in the different broods for 1928–33 are tabulated. The sex ratio over the whole period was 39 : 61. The ratio for the various broods was different, but in contrast to *D. arabis* the percentage of males increased as the season advanced.

The results of the five separate studies of this series [*cf.* **20** 484 ; **21** 368 ; **23** 153] dealing with six species of gall-midges over a period of about five years are discussed. The insects were collected as mature larvae and reared in an outdoor unheated insectary at Harpenden. The methods used were only sufficiently exact to reveal large fluctuations. Additional data on *Contarinia tritici*, Kby., and *Sitodiplosis mosellana*, Géh. [**20** 484] and on *Rhabdophaga heterobia*, H. Lw. [**23** 153] and its parasites for 1932–35 have been obtained, and the numbers of larvae present in the standard sample of 500 ears of wheat and 500 galls on willow respectively during the years 1927–35 inclusive are tabulated. There were considerable rises and falls in numbers from year to year.

The component physical factors of weather, such as temperature and humidity, appear to underlie all fluctuations of populations either by acting directly on the gall-midges, on their food-plants, or on their parasites. Various lines of thought suggested by the data already obtained are emphasised, and although it is not claimed that they are the only solutions to the problems, they are probably logical partial explanations, and may indicate fruitful lines for future research. Weather acting directly on the gall-midges sometimes permanently and sometimes only temporarily alters the sex ratios. The dates between which most of the overwintering broods of a species may be expected to emerge are little affected, but in an early year the insects start to emerge much earlier than in a late one. Apparently the earlier they emerge the longer they take to reach the peak, and such early emergences are not so regular in approaching the peak. It is suggested that a certain more or less fixed amount of temperature is required for development from fully-fed larvae into adults ; and when it has been

available, insects emerge under given favourable conditions from day to day. The actual day to day emergences seem to depend upon day to day conditions, but finally, when the insect is ready to emerge, the urge is overwhelming and the crest of emergence is therefore nearly constant. This suggestion of using accumulated temperatures to forecast expected dates of emergence is to receive further attention.

The number of broods in multi-brooded species appears to be remarkably constant, and may be due more to the effect of the weather on the plant and so indirectly on the insects than on the insects themselves. Unless the weather is suitable for oviposition when the insects emerge, successful egg deposition is not likely to occur, as the adults only live 1–2 days. Although large numbers may be present, unfavourable weather may prevent a serious attack.

As regards the effect of weather on the food-plants, the success of midge attacks depend largely on whether the plant is in the right stage of growth when the midges are ready to oviposit. *C. tritici* and *S. mosellana* only lay eggs on wheat ears when the latter are bursting through their sheaths. Normally the emergence of the midges and the bursting of the ears coincide, but in 1933 the ears burst about 2 weeks earlier than usual and the midges emerged about 3 weeks earlier. There was a large reduction in the population, probably owing to lack of adjustment between plant and insect. The state of the food-plant at the time of oviposition also determines in some cases the form of gall produced. *R. heterobia* and *R. terminalis*, H. Lw., make several types of galls on willow. *Macrolabis corrugans*, F. Lw., seldom manages to establish itself on cultivated parsnip because of the rapidity with which the leaf buds uncurl, but on the buds of cow parsnip [*Heracleum*], which uncurl slowly, it is able to do so. Data on *R. heterobia* show a remarkable fall in the numbers of both midges and parasites in 1930. The population did not return to normal until 1932, but the ratio between the midges and their parasites remained nearly constant during this period. The drought of 1929 was probably responsible for the diminution of numbers. Winter buds were formed on the willows earlier than usual, owing to the lack of sap rising sufficiently well to continue normal autumnal growth, and there was a consequent shortage of food for the insects.

Thirdly, weather affects the parasites. On two occasions there has been a sudden rise in the numbers of midges and a corresponding fall in the numbers of parasites. This was the case in 1929 with *D. alopecuri*, Reut., and was probably the consequence of the early emergence of the parasites in the previous year [**21** 369]. The same reason probably accounted for the outbreak of *R. heterobia* in 1933 when almost double the usual number of midges were present and the percentage parasitism was about 14 instead of 50–60. Parasites of *R. heterobia* appear to be less affected by cold than their host. The study of *D. pyri* indicated that the life-cycle of the parasite is longer than that of its host and that the parasite and host are incompletely adjusted. This may mean a recent change of host on the part of the parasite. Observations on the numbers of *C. tritici* and *S. mosellana* indicated that there was a peak of abundance every 4–6 years and that the next one would be about 1937. Data obtained in 1934 and 1935 have supported this view.

The author concludes that these studies, if continued over a long period, will prove satisfactory as a means of collecting data for forecasting outbreaks of insects. One aim has been to indicate that if

several workers undertook similar studies far-reaching results would be obtained. Only the work on *C. tritici* and *S. mosellana*, and on *R. heterobia* is to be continued.

LEACH (R.). **Insect Injury simulating fungal Attack on Plants. A Stem Canker, an angular Spot, a Fruit Scab and a Fruit Rot of Mangoes caused by** *Helopeltis bergrothi* **Reut. (Capsidae).**—*Ann. appl. Biol.* **22** no. 3 pp. 525–537, 2 pls., 3 diagr., 6 refs. Cambridge, August 1935.

In 1933 *Helopeltis bergrothi*, Reut., was shown to be the cause of a stem canker of tea in Nyasaland [*R.A.E.*, A **21** 153], a stem canker, leaf spot and anthracnose of cotton in the Belgian Congo [**23** 99], and " black arm " of cotton in French Equatorial Africa [**22** 78].

A nymph of this Capsid was found in the act of forming a canker lesion on a young mango stem in Nyasaland in July 1934. Bagging experiments proved that the insect caused stem canker and also angular leaf spot, fruit scab and fruit rot of mangos. The primary lesions are usually recognisable before the insect has withdrawn its stylets. The nymphs and adults feed readily on the young stems, leaves and fruit. No organism has been seen or isolated from the freshly affected tissue, and pieces of this tissue applied to the cut or uncut surface of healthy young stems, leaves and fruits have not transmitted the symptoms. Eggs of *H. bergrothi* are found near the fresh canker lesions on the young stem but have not been seen on the fruit. The structure of the fruit, and microscopic development of the symptoms are described.

In experiments to trace the path of the stylets of the Capsid, cankers were formed on the stems in nearly every case when the stylets ended in the pericycle parenchyma. In very young stems, the stylets are found in many other tissues, probably because they move more freely in the soft, unlignified tissue. Fruit-scab lesions are formed when the stylets penetrate no further than the middle skin, and rot lesions when they reach the inner skin. The lesions on the stem are water-soaked, oval and green, but within 24 hours become slightly sunken and turn yellow-brown at the edges. Longitudinal ridges sometimes occur, caused by the collapse of the parenchyma between the fibrous rings round the longitudinal resin ducts. The lesions later turn completely yellow-brown and become more sunken. After 2 weeks the cankers are no longer sunken and sometimes they are deeply cracked, causing open wounds in the stem. They are often blackened owing to the invasion of the weakened cortex by fungi and bacteria that may enter by means of a bead of sap exuded from the puncture of a fresh lesion.

The Capsid feeds anywhere on the leaves, but frequently at the edges of the veins. Feeding along the midrib and petiole forms elongated lesions that cause curling and puckering of the leaf. The affected area is visible directly the insect stops feeding. The spots gradually become a light yellow-brown with slightly darker edges in 4–5 days, or after 2 weeks in dry weather. In wet weather the tissues discolor more rapidly, and the spots soon become dark brown or black, probably owing to the entry of fungi or bacteria. The spots usually remain papery in the centre, but sometimes the centres fall out and give a shot-hole appearance to the older leaves.

All sizes of unripe fruit are attacked but the younger ones are usually selected. At first the lesion is a round, water-soaked area slightly darker green than the healthy tissue. Within 24 hours it becomes sunken

and turns light brown in the centre, often exuding small drops of resin. In the next 2 days it gradually becomes a well-defined black spot. The blackening, which always takes place, is probably due to some property of the resin in the skin. The spots dry and harden and are confined to the skin, often separated by cork rings. Heavy scabbing of small fruit usually leads to its dropping. The first sign of rot usually appears 12–24 hours after feeding and is apparent as an irregular, dark green, water-soaked zone round the light brown scab lesion. The flesh under this skin becomes rotten, and the seed may also be discoloured. Three-quarters of the fruit's surface may be affected within 3 days. The fruit usually falls from the tree in this stage but the very small fruits, which resemble large raisins, remain for some time. Any larger fruits present shrivel up and become copper-coloured.

The symptoms of these 4 types of injury tend to differ from diseases of fungous or bacterial origin in that the lesions are produced much more quickly, and usually do not increase in size from the time they are first visible, except in the case of fruit rot.

In a footnote, the author states that a black scab of avocado fruit has been proved to be caused by *H. bergrothi*. The symptoms are very similar to those of mango scab.

JARY (S. G.). **Some Observations upon the " Red Spider," *Tetranychus telarius* L., on Hops and its Control, with Notes on some predatory Insects.**—*Ann. appl. Biol.* **22** no. 3 pp. 538–548, 7 refs. Cambridge, August 1935.

The following is largely taken from the author's summary of experiments carried out in the laboratory and field in Kent in 1933 and 1934 for the control of *Tetranychus telarius*, L., on hops. Treating the soil round the plants in November 1933 with crude naphthalene at the rate of 300 lb. per acre did not prevent infestation in the following summer. Examination of hop poles showed that large numbers of mites hibernate in deep cracks in the poles. An emulsion containing 5 per cent. of a high-boiling neutral tar oil, sprayed with force into these cracks, killed most of the mites and was more effective than one containing 5 per cent. of a semi-refined petroleum oil. Of a number of washes applied in the summer of 1934 to infested hops, emulsions of a highly refined (water-white) petroleum oil (two applications at 1 per cent. or one application at 2 per cent.) and lime-sulphur at 1 : 30 and 1 : 60 gave complete control of the mites. A derris wash (containing 0·0056 per cent. rotenone) appeared to give complete control at a second application though it had failed to do so at the first. The toxicity of a derris wash of this type is apparently greater when it has been prepared some time before use. Liver of sulphur (10, 16 and 24 oz. in 100 gals. water) and colloidal sulphur (0·3 per cent.) showed no marked toxicity and the 2 spreaders, sulphonated lorol (0·05 per cent.) and sodium γ-sulphonate (0·05 per cent.), were non-toxic. The petroleum-oil emulsions and lime-sulphur caused some injury to the foliage when applied in late June and the first three weeks in July. Lime-sulphur caused no injury to foliage or " burr " on 3 varieties of hops when applied during late July and early August at concentrations ranging from 1 : 60 to 1 : 150. At strengths of less than 1 : 100 lime-sulphur washes were not markedly toxic to the mites, but at 1 : 60 and 1 : 80 they killed all stages except the eggs.

Predators observed during the experiments were *Anthocoris nemorum*, L., *Stethorus* (*Scymnus*) *punctillum*, Wse., and *Feltiella tetranychi*, Rübs.,

a Cecidomyiid that appears to be recorded for the first time in England. The young nymphs of *A. nemorum* attack the eggs and the older ones the active mites. The adults were often found hibernating in cracks of the hop poles among colonies of mites. The eggs of *S. punctillum*, which was fairly common in hop gardens in 1934, are laid singly on the lower surfaces of hop leaves among colonies of *T. telarius*. The larvae, which destroy the mites and their eggs, pupate among the webs spun by the mites. The life-cycle is completed in 5–6 weeks. Larvae of *F. tetranychi* attacked mites present on heavily infested hop leaves from Sussex.

Davies (W. M.) & Whitehead (T.). **Studies on Aphides infesting the Potato Crop. IV. Notes on the Migration and Condition of alate *Myzus persicae* Sulz.**—*Ann. appl. Biol.* **22** no. 3 pp. 549–556, 4 refs. Cambridge, August 1935.

Investigations continued in Wales [*cf. R.A.E.*, A **23** 492, etc.] showed that winged migrants are the main source of the initial infestation of *Myzus persicae*, Sulz., on potatoes. Migration takes place during June and July from various crucifers on which the wingless forms hibernated or to which the winged forms migrated in early spring [*cf.* **22** 386]. In Flintshire in 1934, when infestation by Aphids was heavy, the main migration occurred during a week (6th–11th July) when the meteorological conditions were ideal. The wind had changed from the north-west to the south-west, the temperature rose from about 67° F. to 80° F. and the relative humidity dropped from 68 to about 30 per cent. The number of individuals on 100 leaves taken at random was 23 and practically all the plants were infested. The hot, dry conditions during this period not only facilitated flight, but also caused the cruciferous weeds to wilt and die and so greatly increased the proportion of winged forms. The index of infestation (23 individuals on 100 leaves) at this centre, where stocks rapidly deteriorate owing to the introduction and spread of virus diseases, was compared with that at a "successful" centre in south Caernarvonshire where the stock has remained practically free from virus infection for over 7 years. Six hours' search failed to reveal a single winged individual at the latter centre. In an experiment with adhesive traps in 1933 during the period of maximum migration, 738 winged Aphids were taken in Flintshire and only 20 in south Caernarvonshire over a period of 10 days. The proportion of winged migrants infected with virus diseases in Flintshire, where the latter spread rapidly, proved to be particularly small. In only 4 of 81 experiments involving 1,178 winged Aphids was leaf-roll transmitted to healthy tubers and possibly only a single vector was concerned in each case. It is concluded that the introduction of virus diseases into a healthy stock by winged migrants is slight, but this small amount is subsequently spread among the crop by apterous forms.

Taher el Sayed (M.). **On the Biology of *Araecerus fasciculatus* De Geer (Col., Anthribidae), with special Reference to the Effects of Variations in the Nature and Water Content of the Food.**—*Ann. appl. Biol.* **22** no. 3 pp. 557–577, 4 figs., 29 refs. Cambridge, August 1935.

The following is almost entirely the author's summary: The time taken for the water content of maize and cacao (the two important foods of *Araecerus fasciculatus*, DeG.) to come into equilibrium with

the moisture in the atmosphere when the latter was between 50 and 100 per cent. relative humidity was determined. The same determination was made roughly for nutmeg. The sex ratio of the beetle in maize at high humidities is about 1 : 1. On nutmeg, which appears to be a less suitable food, more females than males are produced. At 27°C. [80·6°F.] the males mature in 3 days and the females in 6 days after emergence. Pairing takes place 6 days after emergence at this temperature. Females normally pair more than once, but once is enough to fertilise all the eggs. The rate of oviposition gradually increases when fertilisation of the females has been delayed for 1–3 weeks and then falls. The process of oviposition in maize is described. It takes an average of 8 min. at 18°C. [64·4°F.] in light or darkness. Unfertilised eggs are laid loose and not inserted into the food. The incubation period lasts 5–8 days at 27°C. [80·6°F.] at all relative humidities above 50 per cent. The maximum number of eggs laid by 25 females was 137 at 90 and 129 at 100 per cent. humidity. The viability of 640 and 548 eggs was 95 and 98 per cent. respectively at these humidities. At lower humidities the number of eggs laid and their viability was less. The life-cycle cannot be carried on in maize and nutmeg at relative humidities below 60 per cent., or below 80 per cent. in cacao. The minimum length of the total life-cycle varies inversely with the humidity of the atmosphere for maize and nutmeg, the period always being about 10 days less on the former. There is a similar relation for cacao but the curve is not parallel to those for maize and nutmeg. On maize the minimum life-cycle at 27°C. [80·6°F.] varies from 57 days at 60 per cent. humidity to 29 at 100, the variation occurring only in the larval period. The pupa is the only stage that can survive relative humidities lower than 60 per cent. On maize the adults live 27–28 days at 50 per cent. humidity and 86–134 days at 90 per cent. At 100 per cent. the food becomes mouldy. On cacao few live more than 20 days at humidities below 80 per cent. The reduction in length of life is principally due to failure to feed at lower humidities, for when starved the beetles live about the same time at all humidities.

TATTERSFIELD (F.) & MARTIN (J. T.). **The Problem of the Evaluation of Rotenone-containing Plants. I.** *Derris elliptica* **and** *Derris malaccensis.—Ann. appl. Biol.* **22** no. 3 pp. 578–605, 9 figs., 11 refs. Cambridge, August 1935.

The increased production and use as insecticides of derris root and other plants containing rotenone and the variation in the amounts of active principles present in them have led to a need for standard methods of evaluation. In this paper some of the methods suggested are considered and the results obtained from derris samples of known origin are compared with those from other samples. The experiments, which were carried out under similar conditions in Malaya and at Rothamsted, are described. Seven samples of roots were examined, 3 *Derris elliptica*, 2 *D. malaccensis* (Sarawak erect), 1 *D. polyantha* and 1 from Singapore that was also probably *D. elliptica*. The moisture, crude rotenone, recrystallised rotenone, ether extract, methoxyl content, dehydro compounds, and rotenone together with the dehydro compounds in the residual resin were determined for each of the samples. The methods are outlined. Considerable care is necessary to ensure that a representative sample of the root is taken, as unless the roots are ground very finely there is a tendency for the powder to

separate into rich and poor parts. The insecticidal value of the samples was tested on adult wingless females of *Aphis rumicis*, L. In view of the possibility of fluctuation in the mean resistance of the insects, two samples of root were tested at a time and conclusions drawn only from comparisons of each pair. The results are tabulated and analysed according to Bliss' method of probits [*R.A.E.*, A **22** 440]. The proportion of rotenone to total ether extract in the samples of *D. malaccensis* was lower than in those of *D. elliptica* [*cf.* **21** 26]. In all the samples, the methoxyl content calculated on the dehydro compounds accounted for some 60–70 per cent. of the total methoxyl content of the roots in the case of *D. elliptica* and about 40–50 per cent. in that of *D. malaccensis*. It may be possible from observations of this kind to distinguish the two species chemically. When comparisons were made between samples belonging to different species of *Derris*, the determinations of rotenone by the present methods, ether extract or methoxyl content did not express accurately the relative insecticidal potencies of the pairs of samples. When comparisons were made between samples of the same species, all these determinations appeared to give a closer measure of their relative activities. The estimation of the dehydro compounds, or of rotenone plus the dehydro compounds in the resin, gave a better assessment of the relative potencies than the other determinations, whether comparisons were made between samples of the same or of different species.

Morison (G. D.). **Advisory Entomology, 1934–35.**—*Rep. N. Scot. Coll. Agric. 1934–35*, pp. 23–26. Aberdeen, 1935.

Drought in July and August 1934 appeared to increase the damage to heather (*Calluna vulgaris*) by *Lochmaea suturalis*, Thoms., in the northern districts of Scotland. Adults of the Chrysomelid, *Gastroidea viridula*, DeG., appeared in May and disappeared in August ; after stripping the foliage of dock, they caused serious injury to the leaves of nasturtium, viola and pansy. When cereals were cut at the end of August, numbers of winged females of *Limothrips cerealium*, Hal., were dislodged. During the year 237 samples of bees attacked by acarine disease [*Acarapis woodi*, Rennie] were received [*cf. R.A.E.*, A **23** 79].

Armstrong (T.). **The White Apple Leafhopper** (*Typhlocyba pomaria* **McA.**).—*Canad. J. Res.* (D) **13** no. 4 pp. 72–84, 1 pl., 1 fig., 18 refs. Ottawa, October 1935.

An account is given of observations in 1933 and 1934 on the bionomics of *Typhlocyba pomaria*, McAtee, on apple in the Vineland district of Ontario, where it has two generations a year, which overlap slightly in summer. The egg and five nymphal instars are briefly described, and McAtee's description of the adults is quoted.

In both years the overwintering eggs, laid on the bark of the older wood, hatched during the last 3 weeks of May. The nymphs fed on the underside of the leaves, but never on the growing shoots, and completed their development in 19–37 days. The average preoviposition period was 13·4 days in 1933 and 9 days in 1934, the sunny position of the insectary cages in 1934 causing the difference. The females laid up to 132 eggs (av. 53·4) on the lower surface of the leaves in 7–34 days (av. 20·6), from about 18th June. The post-oviposition period was 1–26

days (av. 6·2). Males survived in insectary cages for from 8 days to 3 months, and females for 19–78 days. The incubation period of the summer eggs was 20–64 days (av. 39); the first laid eggs took longer to hatch, those laid on 20th–21st June and 6th–8th August hatching in 50·8 and 25·1 days respectively. Newly hatched nymphs were taken from 17th July to 28th September, but few were taken after 7th September. The nymphs matured in 16–55 days (av. 23) and were most abundant in August. Female adults appeared to be more abundant than males. The overwintering eggs were laid from about 15th August and by the beginning of November all the adults were dead.

This Jassid refused to feed on the fruit, but spots it with excrement. The leaves attacked are slightly mottled and turn yellow-green. The chief predators are birds and spiders. Two parasites that were of considerable importance were *Anagrus armatus* var. *nigriventris*, Gir., which attacks the winter and summer eggs, and *Aphelopus* sp., which attacks adults, chiefly of the first brood.

Insect Pest Control.—*Bull. Wisconsin agric. Exp. Sta.*, no. 430 (Ann. Rep. 1933–34), pp. 3–14, 6 figs. Madison, Wis., June 1935. [Recd. November 1935.]

Investigations were made by C. L. Fluke, E. P. Dunn and P. O. Ritcher in 1934 on new methods of using sodium silicate in removing lead arsenate spray residues from apples. A product of density 58·8° Baumé, containing 19·4 per cent. sodium oxide and 30·6 per cent. silicon dioxide, gave the best results, and was used at a strength of 1 lb. to 40 U.S. gals. Higher concentrations were not much more effective. During the season one variety of apples received two sprays of lead arsenate and lime-sulphur and two of lead arsenate and dried milk. For 172 of the trees sodium silicate was incorporated in the final spray applied on 17th–19th July. During the 15 days that followed there were 2·22 inches of rainfall, but only a very small reduction of residue occurred when no sodium silicate was used. The apples on some of the trees were then given a rinsing spray of sodium silicate or plain water. When sodium silicate was not included in the final spray, the rinsing spray of sodium silicate reduced the residue by about 45 per cent., though clear water was without effect. When sodium silicate was incorporated in the final spray, the residue was reduced by 30 per cent. with no rinsing treatment, and by 40 or 60–75 per cent. with rinsing sprays of water or sodium silicate. On another variety of apples, sodium silicate and sometimes lime-sulphur were included in the final spray. After rinsing with sodium silicate, the residue was reduced by 60 per cent. regardless of the presence of lime-sulphur in the original spray.

The following proved effective as a bait for grasshoppers: 1 bushel sawdust, 1 U.S. gal. whey, 1 lb. arsenic or 1 U.S. pt. sodium arsenite, and water to make spreading easy. In 1934, 8,500 tons were used and the substitution of whey and sawdust for bran and molasses is estimated to have reduced the cost by about £40,000. The grasshoppers consisted chiefly of 4 species, 50 per cent. *Camnula pellucida*, Scudd., 25 per cent. *Melanoplus mexicanus*, Sauss., 15 per cent. *M. bivittatus*, Say, and 9 per cent. *Dissosteira carolina*, L.

Fluke and Ritcher obtained promising results in the control of adult June beetles [*Lachnosterna*] by spraying oak trees [*cf. R.A.E.*, A **23**

730] with 2–4 lb. lead arsenate in 50 U.S. gals. water [*cf.* **21** 515]. The covering power and adhesiveness of the spray were improved by the addition of 1 U.S. qt. miscible oil.

By caging earth cocoons of the squash vine borer, *Melittia satyriniformis*, Hb., T. C. Allen established that the moths in the Racine district continued to emerge throughout July. The females began to oviposit within a week after emergence. Effective control was given by 3 sprays of 3 lb. lead arsenate, 1 U.S. qt. fish-oil soap and 100 U.S. gals. water applied at weekly intervals beginning in the first week of July.

In experiments by J. H. Lilly and Fluke, liquid lime-sulphur (1 : 8–12) gave 97·9–99·0 per cent. control of the case-bearer [*Coleophora pruniella*, Clem.] on apple trees when applied in the autumn, and 65–86·6 per cent. when applied in the dormant period in early spring [*cf.* **23** 151]. The results were better than those given by sprays of tar distillate, petroleum oils or mixtures of the two [*cf.* **21** 602]. The causes of the recent heavy infestation of apple by this case-bearer, which was formerly chiefly a pest of cherry, were investigated. Counts of eggs showed that the Bordeaux spray to prevent cherry leaf spot repelled the moths, and that they tended to oviposit on trees showing the best growth. They began to migrate to apple about 1930, when the Bordeaux spray for cherries was adopted and the use of commercial fertilisers was reduced for cherries but not apples. Parasitism varied from 6–50 per cent. during the spring of 1934 [*cf.* **22** 692], being higher at the edges of large orchards and in isolated orchards. Bait traps caught a relatively high percentage of females that had not completed oviposition, light traps caught more males than females, and most of the latter had laid most of their eggs, and an electrocuting trap caught few moths.

The apple curculio [*Tachypterellus quadrigibbus*, Say] has recently become a serious pest in south-western Wisconsin ; in 1934 nearly half the apples were injured in a few orchards. The overwintered adults feed on the blossom and young apples, ovipositing in those up to 1 in. or more in diameter. The apple usually stops growing, and either drops to the ground or remains on the tree in a mummified condition. The grubs hatch in 4–8 days and feed on the seeds and surrounding tissue for 20 days. They then pupate, and after 4–8 days the adults emerge and eat their way to the surface of the apple. They feed for 10–30 days on the growing fruit and then go into hibernation. The adult feeding and oviposition punctures cause cavities beneath the skin of the apple, which becomes misshapen ; adults of the new generation eat large areas, which become brown and shrunken.

Pepper (J. H.) & Strand (A. L.). **Superheating as a Control for Cereal-Mill Insects.**—*Bull. Montana agric. Exp. Sta.* no. 297, 26 pp., 9 graphs, 3 refs. Bozeman, Mont., March 1935. [Recd. November 1935.]

In the course of experiments in Montana relating to heat sterilisation of flour mills against insects [*R.A.E.*, A **23** 328], the penetration of heat into the floors and walls of mill buildings was studied by the heating of a concrete block, which is described [*loc cit.*]. Previous work on the control of insects infesting stored cereals by superheating is reviewed [**10** 316 ; **20** 224], and the results of the authors' experiments are given in tables and graphs showing the temperatures

obtained at various depths in concrete, wheat, bran, and flour in periods of from 1 to 10 or 15 hours, and the hourly temperatures attained on the ceiling and on and above the floor. In tests on the rate of heat penetration in concrete down to 9 ins. (which might represent the depths of cracks in floors where insects could seek shelter from high temperatures above), the degree of penetration was directly proportional to the increase in surface temperatures. The fatal high temperature of 120°F. was obtained at depths of 4 and 6 ins. after 9 and 10 hours' heating respectively, by which time the surface temperature registered about 150°F. Without the fan, floor temperatures were too low to be effective during 10 hours of superheating. When a means of air circulation was provided and the ceiling temperature allowed to rise to 180°F., a floor temperature of 150°F. was obtained, well above that required in successful heat sterilisation. The greatest depth at which 120°F. was reached in wheat and flour in 15 hours was 2 ins. (the surface temperatures being 209° and 196°F. respectively) and in bran 3 ins. (surface 203°F.). In view of the extremely slow rate of heat penetration into such materials, it is essential to remove at least the larger accumulations before superheating in order to prevent the insects from sheltering in them. Observations are recorded on the stratification of heated air close to the floor surface [**23** 329]. Large unit heaters now on the market are capable of bringing about the required temperatures at a reasonable cost. The experimental results show that superheating if properly carried out should be completed in 24 hours or less.

GRISWOLD (G. H.). **Insect Pests of Iris.**—*Cornell Ext. Bull.* no. 324 pp. 34–39, 1 fig., 4 refs. Ithaca, N.Y., N.Y. St. Coll. Agric., July 1935.

Of the insect pests of iris in the United States, *Macronoctua onusta*, Grote, which attacks practically all varieties, is the most important. Its biology in New York State is similar to that recorded in Indiana [*R.A.E.*, A **17** 39]. The eggs, of which a female may lay as many as 600–700 in 24 hours and a total of more than 1,400, are deposited in clusters and chiefly on dead leaves and other débris. The larvae at first mine in the leaves and later tunnel in the rhizome. They pupate in the soil, and the pupal stage lasts about 5 weeks. The infested plants should be dug out, the larvae removed, and the rhizome carefully cleaned before being reset. To destroy the eggs, all refuse should be cleared from the iris beds and burnt. In the spring, the newly hatched larvae may be killed by spraying the foliage two or three times at weekly intervals with 1 oz. lead arsenate and $\frac{1}{4}$ oz. casein in 1 U.S. gal. water.

The seed pods of irises are attacked by the larvae of *Argyroploce* (*Olethreutes*) *hebesana*, Wlk. [*cf.* **17** 719]. The pods can be protected from the ovipositing moths by covering them with muslin bags. To kill the newly hatched larvae, the pods should be sprayed as soon as they have formed and again 7–10 days later with 2 oz. lead arsenate in 3 U.S. gals water with the addition of 2 oz. fish-oil soap or $\frac{1}{2}$ oz. casein.

The flowers are sometimes disfigured by the feeding of the adults of the weevil, *Mononychus vulpeculus*, F., and the seeds are destroyed by the larvae, which develop and pupate in the pods. According to observations in Illinois, there is only one generation a year, the adults hibernating in débris near the plants. To prevent development in the seed pods, all flower heads should be cut off and destroyed as soon as

they begin to fade. Oviposition may be prevented by covering the blossoms with muslin bags. Spraying the flowers and pods with lead arsenate may also prove effective.

Aphids, of which *Myzus persicae*, Sulz., *M. circumflexus*, Buckt., and *Macrosiphum* (*Illinoia*) *solanifolii*, Ashm., are very common, may be controlled by dusting with 3–4 per cent. nicotine, or spraying with nicotine sulphate and soap. Infested rhizomes should be immersed in this spray. Iris plants infested with *Taenothrips simplex*, Morison (*gladioli*, Moult & Stnw.) should be sprayed with $2\frac{1}{2}$ level teaspoonsful of lead arsenate and 4 tablespoonsful of molasses in 1 U.S. gallon water.

In the late summer and autumn rhizomes that have been injured by *Macronoctua onusta* or bacterial root rot are often infested by the larvae of *Eumerus strigatus*, Fall. These, however, cause no real injury as they only feed on the already decaying tissue.

Knowlton (G. F.) & Smith (C. F.). **Beet Leafhopper Predators—Birds.**—*Proc. Utah Acad. Sci.* **12** pp. 249–253. Provo, Utah, 1935.

Knowlton (G. F.). **Beet Leafhopper Insect Predator Studies.**—*T.c.* pp. 255–260.

In the first of these papers the results are given of the examination of the stomach contents of birds belonging to 25 species, collected from mid-August to mid-October 1934 in north-western Utah among wild food-plants of the beet leafhopper, *Eutettix tenellus*, Baker. It is concluded that birds are an important factor in reducing the autumn population of the leafhopper in desert breeding areas, 17 species out of the 25 examined containing this insect. The numbers of birds taken and of *E. tenellus* in them are recorded in a table.

In the second paper details are given of observations on various insect predators and spiders when confined with the nymphs or adults of *E. tenellus* in small cages or vials. Of the 11 species of insects, the bugs, *Nabis ferus*, L., and *Geocoris decoratus*, Uhl., which frequently occur in sugar-beet fields, killed most leafhoppers. *Chrysopa* sp. was also an active predator, but *Nysius ericae*, Schill., and the Coccinellids, *Hippodamia quinquesignata*, Kby., and *H. convergens*, Guér., were considerably less voracious. *Lygus elisus*, Van D., and *L. hesperus*, Knight, were not definitely observed to attack active leafhoppers, the attempts of *Deraeocoris brevis*, Uhl., to capture leafhoppers were unsuccessful, and *Hippodamia lecontei* var. *uteana*, Csy., did not prey upon them.

Ginsburg (J. M.), Schmitt (J. B.) & Granett (P.). **Comparative Toxicity of Anabasine and Nicotine Sulphates to Insects.**—*J. agric. Res.* **51** no. 4 pp. 349–354, 12 refs. Washington, D.C., 1935.

In preliminary work in 1931, 0·1 per cent. anabasine sulphate applied as a contact spray killed 100 per cent. of honey-bees in 24 hours. Only 10 per cent. died in the same period when fed on honey containing 0·2 per cent. anabasine sulphate.

In 1934, in laboratory tests with sprays of anabasine and nicotine sulphates [*cf. R.A.E.*, A **22** 596] with 0·2 per cent. coconut oil soap as wetting agent, each at a dilution of 1 : 2,400 gave over 90 per cent. mortality of *Aphis pomi*, DeG., and *Aphis rumicis*, L. At half or a quarter of this strength anabasine sulphate was decidedly more toxic than nicotine sulphate ; at 1 : 4,800 it killed over 90 per cent. of both

Aphids. *Macrosiphum rosae*, L., was more resistant to both sprays, but anabasine sulphate was in all cases more efficient. The wetting agent used alone killed 14, 21 and 13 per cent. of the three Aphids, respectively. In greenhouse tests with a dilution of 1 : 2,400 against Aphids on chrysanthemums, both insecticides killed 100 per cent. of *Macrosiphum* (*Macrosiphoniella*) *sanborni*, Gill., but anabasine sulphate killed 87·1–87·8 per cent. of *Rhopalosiphum rufomaculatum*, Wilson, and nicotine sulphate only 32·1–28·8 per cent.

When applied as a stomach poison to *Bombyx mori*, L., at dilutions of 1 : 400, nicotine sulphate killed 100 per cent. in 2 days and anabasine sulphate 30 per cent. in 3 days. At 1 : 800 they killed 95 and 15 per cent. respectively in 3 days. The neutral wetting agent used (0·1 per cent. Arescap) killed none. When adults of *Melanoplus femur-rubrum*, DeG., were fed on tomato plants sprayed with dilutions of 1 : 800 and 1 : 400 with 0·1 per cent. Arescap, nicotine sulphate killed 80 and 90 per cent., and anabasine sulphate 40 and 60 per cent. Arescap alone killed 15 per cent.

GERSDORFF (W. A.). **The Toxicity of optically Active and Inactive Dihydrodeguelins.**—*J. agric. Res.* **51** no. 4 pp. 355–361, 9 refs. Washington, D.C., 1935.

Rotenone, optically active (laevo) dihydrodeguelin, deguelin, and optically inactive dihydrodeguelin were found to be toxic to goldfish in that order.

JOHNSON (H. W.) & HOLLOWELL (E. A.). **Pubescent and Glabrous Characters of Soybeans as Related to Resistance to Injury by the Potato Leaf Hopper.**—*J. agric. Res.* **51** no. 4 pp. 371–381, 5 figs., 15 refs. Washington, D.C., 1935.

In the progeny of a cross between Illini (rough-hairy) and dominant glabrous soy beans, grown in Virginia in 1931, 1932, and 1933, the glabrous homozygotes and the heterozygotes were all heavily infested with *Empoasca fabae*, Harris [*cf. R.A.E.*, A **19** 480], severely stunted in growth and had curled leaves with yellow necrotic margins, whereas the rough-hairy individuals were almost uninfested, grew vigorously and showed no symptoms of leafhopper injury. Glabrous and appressed hairy soy beans were introduced from the Orient and grown adjacent to the progenies in 1931–32. The glabrous plants were heavily infested and stunted, while the appressed hairy plants were less heavily infested and not so stunted, although many of their leaves were crinkled and had yellow margins, which became necrotic. Some of the glabrous introductions contained rough-hairy plants, probably segregates, which were practically free from leafhoppers and showed no symptoms of injury. Resistance to leafhopper injury is apparently due to the rough-hairy pubescence, or to some character the inheritance of which is controlled by the same hereditary complex, but no evidence of such a character was found.

STEHLÉ (H.). **Intérêt des méthodes biologiques dans la protection des cultures de la Guadeloupe.**—*Agron. colon.* no. 214 pp. 98–101. Paris, October 1935.

This is a general discussion of the desirability of introducing parasites for the control of insect pests in Guadeloupe, particularly *Diatraea saccharalis*, F., on sugar-cane and maize, *Aspidiotus destructor*, Sign.,

on coconut, and another Coccid, probably *Selenaspidus* (*A.*) *articulatus*, Morg., on *Citrus*.

Borgmeier (T.). **Sobre alguns Cynipideos parasiticos e cecidogenos do Brasil (Hymenoptera, Cynipidae).** [Some parasitic and gall-forming Cynipids of Brazil]—*Arch. Inst. Biol. veg.* **2** no. 1 pp. 97–124, 13 figs., 6 pls., 18 refs. Rio de Janeiro, September 1935. [Recd. December 1935.]

The species dealt with include: *Aspicera bacchicida*, sp. n., from puparia of a Syrphid, *Baccha* sp., preying on *Saissetia coffeae*, Wlk. (*hemisphaerica*, Targ.); *Ganaspis carvalhoi*, Dettmer [*R.A.E.*, A **18** 327] from *Lonchaea* sp. infesting peach; and *Eucoila* (*Pseudeucoila*) *brasiliensis*, v. Ihering, from puparia of *Drosophila* sp. infesting plums.

Davidson (J.). **Rainfall-Evaporation Ratio in Relation to Locust and Grasshopper Outbreaks.**—*Nature* **136** pp. 298-299, 1 map. London 24th August 1935.

In the summer of 1932–33 small local swarms of *Chortoicetes terminifera*, Wlk., appeared in South Australia in the areas to the north of the 10 inch annual isohyet; in 1933–34 the grasshoppers were more widely distributed, and in 1934–35 they spread southwards, invading the agricultural areas of the State. The endemic centres appear to lie in the pastoral country, where the annual precipitation is about 5–10 inches, the bulk falling during the summer rains, with which is associated the appearance of swarms. The eggs are laid in summer in particular soils, to the depth of 2 inches. Since the temperature over the greater part of southern Australia is never sufficiently low to inhibit their development, this will depend on the presence of sufficient soil moisture, which is determined primarily by the ratio of rainfall over evaporation. A map of South Australia is given, showing the months and areas in which the mean monthly values of R/E are 0·5 or over, which are considered as giving adequate soil moisture for the development of the eggs. If the wet season opens early, hatching will occur in autumn or early winter, during which mortality is heavy; when it starts late, the hatching takes place towards the spring, and the survival rate is very high, as was the case in 1934. Hence the temporary invasions of the southern portion of South Australia are closely correlated with the rainfall of particular seasons.

Grasshopper Control.—*J. Dep. Agric. S. Aust.* **39** no. 2 pp. 174–178, 2 figs. Adelaide, September 1935.

An account is given of the organisation of control of *Chortoicetes terminifera*, Wlk., on the lands of Renmark Irrigation Trust, South Australia. Measures were carried out by the landholders and consisted of ploughing of egg-infested land, burning, spraying and using baits poisoned with sodium arsenite, the last being the only one absolutely effective.

Noble (N. S.). **An Egg Parasite of the Plague Grasshopper.**—*Agric. Gaz. N.S.W.* **46** pt. 9 pp. 513–518, 6 figs., 3 refs. Sydney, September 1935.

Parasites of *Chortoicetes* (*Calataria*) *terminifera*, Wlk., obtained during a severe infestation in New South Wales in the spring and early summer

of 1934 included *Scelio fulgidus*, Crwf., which attacks the eggs. The first instar and mature larvae and the adults are briefly described. Of 444 adults collected in one locality, 85·59 per cent. were females, but of 1,717 reared from egg-masses from another locality, only 60·22 per cent. were females. The average number of eggs per female for 5 females was 233·6. The eggs of *C. terminifera* are laid in the soil; those laid in autumn do not hatch until early spring. It is evident that the parasite passes the winter within the grasshopper eggs. Sometimes more than one parasite larva was found in the same egg, but never more than one matured. The larva eats the contents of the egg and then pupates within the shell. The adults, after emerging, force their way up to the surface of the soil. Where the parasites are abundant, the surface of the ground is marked with millions of minute emergence holes. The grasshoppers and parasites emerge at about the same time, but the period of emergence of the latter lasts about 2 months and that of the former about 11 days. From 1 sq. ft. of a grasshopper egg bed from one locality 402 hoppers emerged between 21st and 31st January 1935 and 1,717 parasites between 23rd January and 20th March 1935. From a portion of an egg bed in another locality 947 parasites emerged between 11th February and 23rd April, more emerging in the second half of the period. All immature stages of the parasite were present in the same egg-mass at times. The application of water to dry soil containing parasitised eggs was invariably followed by the emergence of large numbers of adults. Many adults, however, emerged periodically from eggs in soil that was extremely hard and dry. Numerous eggs dissected contained adults, which flew away directly the egg shell was broken and which appeared to be lying protected within the egg and were ready to emerge at any time. In the laboratory adults lived a maximum of 21 days; the females lived longer than the males. Dead adults were seen in the field 2 weeks after emergence. The length of the life-cycle approximates to the incubation period of the eggs of *Chortoicetes*, which varied from 3 to 5 weeks for the first summer brood according to the locality; and temperature, rainfall and soil moisture have similar effects on the development of the host and parasite. It is concluded that *S. fulgidus* is incapable of preventing the occurrence of periodical plagues of grasshoppers, but is important in reducing their numbers.

Noble (N. S.). **The Stag-horn Fern Beetle,** *Halticorcus platycerii* **Lea.** —*J. Aust. Inst. agric. Sci.* **1** no. 3 pp. 115–117, 6 figs., 2 refs. Sydney, September 1935.

Following considerable damage to stag-horn ferns [*Platycerium alcicorne*] in the Sydney district during the past few years by *Halticorcus platycerii*, Lea, especially in late summer and autumn, the bionomics of this Halticid were studied in 1934, when it was found that the adult beetles are responsible for the oval irregular holes in the fronds, the larvae being true leaf-miners. A single adult may eat out several dozen holes in one day, usually in the dorsal surface of the frond. The generations overlap throughout the year. All stages are briefly described; the adults resemble the beneficial steely-blue ladybirds of the genus *Orcus* and are, consequently, frequently left undisturbed when damage is caused. The adults live for long periods, several collected in March surviving until mid-October. The eggs are laid singly in small cavities eaten out by the female, usually in the dorsal surface of the

frond. In the laboratory, small numbers were laid daily for a period of 2 months, and one female that emerged in March was observed ovipositing in August. In the autumn, the egg stage lasted 9–12 days, the larval 28–31, and the pupal 17. As many as 40 larvae may occur in a single frond ; the injured tissues become infected with rot organisms and the frond turns brown and falls prematurely. Pupation takes place at the base of the broad sheath-like sterile fronds or under the loose edges of the latter, in cells constructed by the larvae in the fleshy underlayers.

Veitch (R.). **Corn Ear Worm.**—*Qd agric. J.* **44** pt. 3 pp. 280–285, 13 figs. Brisbane, 1st September 1935.

The larvae of *Heliothis armigera*, Hb. (*obsoleta*, F.) do serious damage to the leaves, squares and bolls of cotton in Queensland. They also attack tomatos, tobacco, maize, lucerne, and various weeds. The females lay about 1,000 eggs singly on the flowers, flower-buds or foliage during the fortnight after emergence. The larvae hatch in 3–6 days and mature in 2–3 weeks ; the pupal stage is passed 3–4 ins. deep in the soil and lasts 10–14 days in warm weather. As cotton is not severely attacked until mid-December, and the larvae infesting it are of the third generation, it is important to eliminate weeds on which the preceding 2 generations occur. Maize fields should be ploughed before spring to destroy overwintering pupae, and maize trap crops should never be planted earlier than late November. Cultural control measures should also be employed to protect tomatos, maize and lucerne, on which arsenicals are undesirable, but early harvesting of the first crop of lucerne reduces attack on the second. On tobacco 1 lb. lead arsenate with 25 lb. pollard or maize meal, applied to the tips every fortnight, gives good control of *Heliothis*, and also of the cluster caterpillar, *Prodenia litura*, F.

Ramakrishna Ayyar (T. V.) & Margabandhu (V.). **The Moth Borer** (*Argyria sticticraspis* **H.) of Sugarcane in South India.**—*Agric. Live-Stk India* **5** pt. 5 pp. 503–521, 4 refs. Delhi, September 1935.

A study was carried out in 1930–32 on the bionomics of the sugar-cane moth borer, *Argyria sticticraspis*, Hmps., in Madras [*cf. R.A.E.*, A **21** 674]. The average and maximum numbers of eggs laid by single females were 229 and 405. The larvae hatch in 3–4 days. A single larva injures several shoots, especially if tillers have been put forth in clusters. Pupation takes place inside the shoots and the pupal stage lasts 6–18 days. The adults are active only at night and generally hide during the day in cane trash or cracks in the soil. When fed on molasses, the females lived up to 12 days and the males up to 9.

The effect on yield of damage caused to sugar-cane at different stages of development is discussed in detail. In experimental plots, infestation of young shoots in the early stages, from the time of germination up to the time of first wrapping, when superfluous tillers are removed, did not cause any appreciable reduction of the ultimate yield. In the case of damage to primary shoots in the early stages, unattacked canes weighed more than infested ones, but the effect of the infestation on the yield could not be correctly determined. Infestation of the internodes of mature canes makes them hard, devoid of juice and

difficult to mill, and the purity of the juice and the quality of the jaggery are affected. Serious damage has also been caused to seedlings.

Studies of the relation of infestation to environmental factors showed that it is favoured by absence of irrigation and rain. Early plantings during the hot months were the most infested, and in those that synchronised with the early rains the infestation decreased. Light and space had apparently no effect. The results of observations on the resistance of different varieties of sugar-cane to infestation were inconclusive. The breeding of the moth is favoured by the continuous presence of the crop, as planting is effected while harvest is going on, and the failure to destroy infested superfluous tillers removed during the time of first wrapping.

The eggs are parasitised by *Trichogramma minutum*, Riley, and *Phanurus beneficiens*, Zehnt., and the larvae by *Stenobracon nicevillei*, Bingham.

No tests have been made of the comparative effectiveness of the control measures usually recommended, such as collecting the egg-masses, cutting out the dead hearts, burning trash, etc. It is planned to make an attempt to use *T. minutum* for biological control. Tests of insecticides, carried out in 1927 and 1928, showed that they could not be effectively applied.

PRUTHI (H. S.). **The Codling Moth in India.**—*Agric. Live-Stk India* **5** pt. 5 pp. 522–523, 2 pls. Delhi, September 1935.

The codling moth, *Cydia* (*Laspeyresia*) *pomonella*, L., which (except for a doubtful record from Kashmir) has not previously been recorded in India, was found in 1935 in the environs of Quetta, northern Baluchistan, infesting apples together with *Eucosma* (*Spilonota*) *ocellana*, Schiff. With a view to assisting fruit-growers in various parts of India in its identification, all stages are briefly described, and notes are given on its bionomics and control.

GRIST (D. H.). **Derris (Tuba Root).**—*Malay. agric. J.* **23** no. 10 pp. 477–482, 16 refs. Kuala Lumpur, October 1935.

This paper, which is compiled chiefly from the Malayan literature, includes a brief account of the cultivation, harvesting and preparation of derris, and the appearance of the 2 species, *Derris elliptica* and *D. malaccensis*, commonly grown in Malaya [*R.A.E.*, A **22** 483]. The toxic constituents of both species are discussed [*cf.* **21** 26, 617; **23** 453]. Notes are given on the chief insect pests of field and stored derris and their control [*cf. R.A.E.*, A **22** 445, 614; **23** 89], and on its effect [*cf. R.A.E.*, A **23** 295, 326] and uses as an insecticide. The demand for this product, the sales of which are now based on ether extract or rotenone content, will probably increase.

GARCIA (C. E.). **A Field Study on the Citrus Green Bug** *Rhynchocoris serratus* **Donovan.**—*Philipp. J. Agric.* **6** no. 3 pp. 311–325, 4 pls., 7 refs. Manila, 1935.

An account is given of the results of observations in 1933 and 1934 on the bionomics of *Rhynchocoris serratus*, Don., which is widely distributed in the Philippines and is a serious pest of *Citrus*, feeding chiefly

on the smaller fruits and causing them to drop. The geographical distribution of this Pentatomid is outlined and all stages are described. Females laid an average of about 150 eggs, depositing them in small batches on the upper surface of the leaves at intervals of 2–9 days. The nymphs hatched in about a week and matured in 25–40 days. In the first instar they are gregarious and feed on the leaves, but afterwards disperse and usually feed on the fruit. During the hottest part of the day the bugs hide among the foliage. They were scarce from September to November, and abundant from May to August, which is the fruiting season. The nymphs were destroyed by the Mantid, *Hierodula patellifera*, Serv., and the ant, *Oecophylla smaragdina*, F.

In experiments in which sprays were applied to the trees at intervals of 5 days, 2 per cent. soap gave satisfactory control of the nymphs and 0·2 per cent. nicotine sulphate with the addition of 1 per cent. soap killed both nymphs and adults. Light traps were ineffective.

DE FRANCOLINI (J.). **L'emploi du bromure de méthyle pour le traitement des graines de semence.**—*Rev. Path. vég.* **22** fasc. 1 pp. 1–8. Paris, 1935.

In experiments carried out in Morocco in February 1934, 100 per cent. mortality of all stages of *Calandra* (*Sitophilus*) *oryzae*, L., and of a small number of *C. granaria*, L., infesting wheat was obtained by exposure to methyl bromide [*cf. R.A.E.*, A **23** 194] at the rate of 2 oz. per 100 cu. ft. at 19·5°C. [67·1°F.]. During the first hours of exposure the weevils became very active, but activity gradually diminished until after about 6 hours all movement ceased. In further tests 100 per cent. mortality of the adults of *C. oryzae* was obtained in 2 hours with the same amount of fumigant by exposing them in glass tubes closed with muslin under bell-jars at 22°C. [71·6°F.], though some of the weevils did not die until the next day. All larvae within the grains were killed by an exposure of 24 hours to 1 oz. per 100 cu. ft. at 21°C. [69·8°F.]. Even at the rate of $5\frac{1}{2}$ oz. per 100 cu. ft. for 24 hours, methyl bromide only slightly reduced the germinating power of wheat and other cereals.

DE FRANCOLINI (J.). **Action sur les produits végétaux du bromure de méthyle en fumigation sous vide partiel.**—*Rev. Path. vég.* **22** fasc. 1 pp. 9–12. Paris, 1935.

Tests were carried out in Morocco to determine the action of methyl bromide [*cf. R.A.E.*, A **23** 194] on a variety of fruits, vegetables and plants exposed to dosages of 6–7 oz. per 100 cu. ft. for an hour at 22–26°C. [71·6–78·8°F.]. A partial vacuum was maintained for 20 minutes, after which pressure was brought back to normal, and the products were ventilated for 10 minutes after fumigation. Bananas became soft and blackened, pears became soft without showing outward change, and potatoes became brown and slightly soft, but none of the other fruits or vegetables tested suffered. Of 25 plants the only ones injured were *Fuchsia*, *Iresine* and *Zantedeschia*, the leaves of which withered and dropped 48 hours after exposure. Susceptibility to methyl bromide appears to be related to the water content of the plants or fruits. A series of tests showed that the proportion of hydrobromic acid given off by methyl bromide in a saturated atmosphere does not exceed 2 per mille if the fumigation is of normal duration.

Gros (R.). **Etude expérimentale de l'effet toxique de l'aceto-arsenite sur le doryphore de la pomme de terre.**—*Rev. Path. vég.* **22** fasc. 1 pp. 25–41, 1 graph, 6 refs. Paris, 1935.

In a continuation in 1934 of experiments begun in France in 1933 on the effect of arsenicals on larvae of *Leptinotarsa decemlineata*, Say, on potato [*R.A.E.*, A **23** 487], a similar technique was followed to determine the percentage and rapidity of mortality caused in the third and early fourth instars. The copper aceto-arsenite (Paris green) used in the tests contained 56·8 per cent. arsenic trioxide and 24·12 per cent. metallic copper, the average dimensions of the fine dust particles of which it was composed being 3–5 μ and the apparent density 0·70. Diplumbic lead arsenate was used at the standard concentration (10 lb. to 100 gals. for a 95 per cent. arsenate) and this gave a good distribution of arsenic on the leaves. As the concentration of Paris green used was only 5–0·5 lb. to 100 gals., it was made up to 20 lb. by mixing it thoroughly with an inert dust, this mixture preventing uneven distribution and scorching of the foliage. Variations in the quantity of arsenic (As) deposited on the foliage were proportional to the quantity present in the spray liquid.

It was not until the concentration of Paris green was reduced to 0·6 lb. that mortality dropped to as low as 80 per cent., and all larvae were killed within 1–2 days by a concentration of 1·2 lb., producing a deposit of 5–8 μ As per sq. cm. leaf surface. Increases in the deposit above 9–10 μ, which killed almost all larvae in less than 24 hours, had little effect on the rapidity of toxic action. In a comparative test all larvae were killed with a deposit of 5·5 μ As in the form of Paris green, whereas 12·5 μ was required with diplumbic lead arsenate. The rapidity of action of Paris green was also greater.

When larvae were fed on leaves gathered immediately or at intervals after treatment, there was little change in the eventual degree of mortality, but a definite reduction in rapidity of toxic action occurred where foliage was used at intervals of 36 hours and 6 days after treatment. It was also observed that when larvae die within 24 hours, they cease to feed 4–5 hours after having received the treated foliage. Only in cases of 2–3 days' survival do the larvae continue to feed for 1–2 days, and later feeding does not amount to more than 10 per cent. of the amount consumed on the first day. It appears, therefore, that the rapidity of mortality is proportional to the amount of arsenic consumed on the first day. When a larva consumes about 3 μ As in the form of Paris green, it dies in 24–48 hours. A decrease in the amount of deposit is compensated for by an increase in the surface consumed. To produce the same degree of mortality in the same length of time, the quantity of As consumed in the form of diplumbic lead arsenate must be 3 times as great as that consumed in the form of Paris green.

On the basis of analyses of foliage from different parts of sprayed plants to determine the deposit obtained under field conditions, treated foliage was divided into 3 classes, each representing about one-third of the plant. The first had received a heavy deposit, the second a medium deposit, and the third had not received any apparent deposit, although subsequent tests showed that there was sufficient on it to effect a certain degree of mortality. Feeding on foliage with a medium deposit produced total mortality in 48 hours, and this is taken as the average for the whole plant. It is concluded that under field conditions practically all larvae in the third and early fourth instars are killed in

48 hours by a spray containing 0·8 lb. arsenic to 100 gals. in the form of Paris green. Only 60 per cent. mortality in 48 hours was obtained by Trouvelot with one containing 2 lb. arsenic in the form of diplumbic lead arsenate.

MALLAMAIRE (A.). *Bixadus* (*Monohammus*) *sierricola* **White. Longicorne nuisible au caféier en Côte d'Ivoire.**—*Rev. Path. vég.* **22** fasc. 1 pp. 42–56, 2 figs., 12 refs. Paris, 1935.

The Lamiid, *Bixadus* (*Monohammus*) *sierricola*, White, the larva, pupa and adult of which are described, attacks coffee in the Ivory Coast, where it was studied in 1932. It is certainly not specific to coffee, and infestation comes primarily from the forest, but healthy coffee trees of all ages are attacked, and not merely old and withering ones as hitherto believed. The adults, which die immediately after pairing and oviposition, lay their eggs in crevices in the bark of the trunk. The larva lives for a time in the sapwood before tunnelling deeply into the stem. The gallery is oval and begins to ascend or descend on reaching the heartwood. It sometimes runs the whole length of the trunk, is often multiple, and frequently passes downwards as far as 12 inches below the collar to the level of the second bundle of secondary roots. In old and heavily infested trees of *Coffea robusta* or *C. arabica*, galleries were found to a height of over 6 ft., continuing into the larger branches. After 5–6 months, the larva makes a pupal chamber, in which it remains for 7–8 days before pupating. The pupal stage lasts 30–40 days. The adults can fly for a distance of a mile when attracted by a sufficiently powerful light, but infestation rarely advances by more than one or two rows of trees after each generation, as they normally fly little, pair immediately and live only 15–20 days. They feed little, and fly at dusk. The beetle has 2 generations a year in the Ivory Coast, with maximum emergence from the end of August to the middle of September, and from the end of January to mid-February. The generations overlap and slight variations occur in relation to geographical position and local climate.

Infested coffee trees may be recognised by the presence of small heaps of sawdust that fall from numerous holes in the trunk. Young trees are completely girdled and die, but older ones are more resistant and may show as many as 4 incomplete attempts at girdling at different levels. When there is only one mine it follows the heartwood, but when many larvae attack the same trunk mines are found in all parts of the wood.

Coffee should be planted at least 30 yards from the forest, the intervening space being used for food crops. All coffee trees in established foci of infestation should be uprooted and burned. The adult beetles may be caught with light traps. Killing the larvae in their mines with a wire or by injecting kerosene, scraping and painting the grooves on girdled trunks with pitch or coal tar, and stopping the entrance holes of the mines with putty have been found effective. Coffee trees should be treated at least twice a year before the emergence of the adults of the two generations.

MESNIL (L.). **Note préliminaire sur les cassides nuisibles à la betterave.** *Rev. Path. vég.* **22** fasc. 2 pp. 99–104, 5 figs., 6 refs. Paris, 1935.

Characters distinguishing *Cassida nebulosa*, L., *C. vittata*, Vill., and *C. nobilis*, L., the three species of the genus that attack sugar-beet in

Europe, are indicated. *C. nebulosa* is the most widely distributed in France, but is not a serious pest. The adults emerge from hibernation in May and feed on leaves of various Chenopodiaceae. The eggs, which hatch in about 8 days, are laid in batches of 5–10 on the underside of the leaves of *Chenopodium, Atriplex* and sugar-beet, on which the larvae feed and pupate. A second generation occurs in July–August [*cf. R.A.E.*, A **21** 527].

C. vittata is rare in France and its attacks have not been observed, though it does much damage in Italy [*cf.* **18** 562, etc.] and Spain [**20** 250].

C. nobilis although a serious pest in North Italy, Germany [**21** 526] and Czechoslovakia has only recently been reported in France as infesting sugar-beet and spinach in Meaux (Seine-et-Marne). It is usually somewhat scarce, but in some years it multiplies rapidly and does much damage. Caryophyllaceae are alternative food-plants.

Bovey (P.). **Sur les importants dégats occasionnés en 1933 dans les vergers de montagne de Suisse Romande par** *Argyresthia conjugella* **Zell.**—*Rev. Path. vég.* **22** fasc. 2 pp. 105–114, 1 pl., 5 figs., 14 refs. Paris, 1935.

A severe infestation of apples by *Argyresthia conjugella*, Zell., occurred in the mountain orchards of French Switzerland during 1933, particularly in the Joux Valley, where the complete harvest was destroyed, and in the Alpes vaudoises. Several larvae were found in each fruit, and in some cases as many as 30–40 entrance holes were counted. Most of the apples dropped in August, and those that ripened were deformed and useless. The attack on apples was due to the absence of berries of mountain ash (*Sorbus aucuparia*) owing to an early spring frost [*cf. R.A.E.*, A **14** 111 ; **16** 235]. In 1934 the mountain ash bore a normal amount of fruit, and no infestation of apples occurred. There is one generation a year, and the winter is passed in the pupal or larval stage in a cocoon just below the soil surface or among fallen leaves, etc.

Viennot-Bourgin (—). **Sur les dégats occasionnés par** *Cnephasia virgaureana* **Treits., dans les cultures de fraisiers de l'est de la France.**—*Rev. Path. vég.* **22** fasc. 2 pp. 115–122, 1 pl., 1 fig., 11 refs. Paris, 1935.

Cnephasia wahlbomiana virgaureana, Tr., the distribution and food-plants of which are reviewed from the literature, damaged strawberry in Saône-et-Loire during 1935. The complete course of its life-cycle has not been ascertained, but before the flowering season the larvae skeletonise the strawberry leaves. When the flower buds are sufficiently developed, the larvae enter them and cause the heart of the flower to wither. During the daytime they rest in shelters of silken threads that connect the calyx to the peduncle. Several buds may be destroyed by one larva, and each plant may harbour four or five. The full-grown larvae return to the leaves, where they spin cocoons and pupate. The pupal stage lasts about 10 days.

Bouhelier (R.) & Hudault (—). **Note sur** *Hellula undalis* **F., pyrale nuisible aux crucifères dans le Maroc occidental.**—*Rev. Path. vég.* **22** fasc. 2 pp. 123–130, 2 figs., 3 refs. Paris, 1935.

Hellula undalis, F., of which *Evergestis occidentalis*, de Joann [*R.A.E.*, A **19** 666] has been found by Meyrick to be a synonym, attacks

cabbage and other crucifers along the entire coastal region of Morocco between Rabat and Safi. On wallflowers it is sometimes associated with *Cydia* (*Grapholitha*) *leplastriana*, Curt. The immature stages are described.

The life-history was studied in the laboratory at Casablanca. The females laid 50–100 eggs singly or in groups on the food-plant, generally at night. These hatched in 4–5 days in the hot season. The larval period lasted 3 or 4 weeks in autumn and up to 7 in colder weather. The larvae moved mainly at night and spun many silk threads. The pupal stage lasted 10–15 days and probably longer in cold weather. It was spent in the soil at a depth of about 2 ins. or sometimes among leaves and rubbish on the surface. Adults lived for 7–10 days in the laboratory when fed on molasses and water. Their habits are nocturnal. The life-cycle lasted 35–45 days in late summer and early autumn and 75–80 in colder weather. From June to January 4 generations were reared in the laboratory, and probably the same number occur in the field under favourable conditions. From February to May no activity was observed, but it is not known in what form the insect hibernates.

Trouvelot (B.) & Grison (—). **Variations de fécondité du** *Leptinotarsa decemlineata* **Say avec les** *Solanum* **tubérifères consommés par l'insecte.**—*C. R. Acad. Sci. Fr.* **201** no. 22 pp. 1053–1055. Paris, 1935.

It has been observed in France that when various tuberiferous solanaceous plants are infested by *Leptinotarsa decemlineata*, Say, some of the species, particularly *Solanum edinense*, always receive numerous egg batches. To ascertain which of 6 different plants are preferred for oviposition, pairs of freshly emerged adults, after being fed on potato, were placed in the open in cages containing clumps of the plants. Three parallel series of tests were carried out in August 1934 with cages each containing 5 clumps of plants of the same species. The largest number of egg batches was found on *S. edinense*, 2 of the 3 cages yielding eggs (8 batches), while on potato only 1 batch was found. No eggs were laid on *S. caldasii*, *S. utile demissum* or *S. commersonii*, although the beetles remained alive as long on these as on the other plants. These observations were completed in June–July 1935 with adults that had emerged from hibernation in the soil and had been fed for some days on potato leaves. Three parallel series of tests were again carried out using *S. jamesii* as well as the other plants, 5 plants of each being placed in each cage with 2 pairs of the beetles. The number of egg batches and (in brackets) the average number of eggs per batch were 35 (35) on *S. edinense*, 29 (25) on potato, 0 on *S. commersonii*, 13 (12) on *S. utile demissum*, 9 (15) on *S. caldasii*, and 8 (8) on *S. jamesii*. On the last 3 the eggs were so few that the resulting larvae did not prevent the plants from developing without difficulty. Complementary tests with *S. commersonii* showed that insects fed on that plant did not oviposit. Egg batches were most abundant on potato, *S. jamesii* and especially *S. edinense* at the beginning of the adult life but least so on *S. caldasii* and *S. utile demissum*. When insects were placed in cages containing all the species of plants, they appeared to be equally attracted to all of them except to *S. jamesii* and *S. caldasii*, which were comparatively deserted. In these circumstances also fertility was

influenced by the plant devoured. For instance the clumps of *S. edinense* received four times as many eggs as those of potato and few eggs were laid on the other plants.

PAILLOT (A.). **Nouvel ultravirus parasite d'***Agrotis segetum* **provoquant une prolifération des tissus infectés.**—*C. R. Acad. Sci. Fr.* **201** no. 22 pp. 1062–1064, 2 figs., 2 refs. Paris, 1935.

The virus disease recorded in a larva of *Euxoa* (*Agrotis*) *segetum*, Schiff., near Lyons [*R.A.E.*, A **22** 227] is here designated as pseudograsserie 1 and another type found infecting larvae of the same Noctuid in a neighbouring locality as pseudograsserie 2. Cellular reaction due to this new virus differed essentially from karyokinetosis [*cf.* **7** 486]. The disease was transmissible by injection of infected blood but transmission *per os* was more difficult.

AUGUSTIJN (C. J.) & VERKADE (J.). **De rouwvlieg-larve als beschadiger van jonge varens.** [The Larva of *Sciara* as a Pest of young Ferns.]—*Tijdschr. PlZiekt.* **41** no. 11 pp. 301–308, 1 pl. Wageningen, November 1935.

Since 1920 injury to ferns in nurseries by larvae of *Sciara* has increased in Holland. The attack becomes visible when a seed-bed is green, through the discoloration of the prothalli. Fumigants, such as nicotine and calcium cyanide, did not prove sufficiently effective against the adult flies, and Paris green, lead arsenate and mercury bichloride not only failed to kill the larvae when watered into the seed-beds, but also injured the ferns.

Experiments showed that the larvae were killed by the passage through the soil of an alternating electric current at about 500 volts [*R.A.E.*, A **22** 665]. An installation capable of treating seed-beds with an area up to about 86 sq. feet was fitted in a commercial greenhouse. It has a safety device in the form of an automatic cut-off operated by the opening of the door. It was found that a sterilised top layer of soil passed about 200 milliamps and a non-sterilised one about 1,000, so that sterilised soil allows a larger surface to be kept under tension. Beginning 3 days after sowing, a daily application of current should be made for 2–3 minutes, or 6 if the larvae are numerous. If they are very abundant, a second application in the day is advisable. Two brief successive applications are more effective than one long one. The beds must be kept well moistened, or the roots will become too dry. For work on a small scale a portable apparatus, in which a seed-box can be placed, has been put on the market.

VAN DER HELM (G. W.). **Is biologische bestrijding van het spint mogelijk ?** [Is biological Control of the Red Spider possible ?]—*Tijdschr. PlZiekt.* **41** no. 11 pp. 313–315, 1 pl. Wageningen, November 1935.

Instances are recorded of *Stethorus punctillum*, Wse., preying on *Tetranychus telarius*, L., infesting grape-vines and peach under glass in in Holland. Reference is made to a similar observation in Belgium [*R.A.E.*, A **23** 290] and to the failure to establish the Coccinellid in greenhouses in England [**23** 477].

Helm (A.). **Die Apfelblattminiermotte** (*Lyonetia clerkella* **L.**).—*Kranke Pflanze* **12** no. 12 pp. 190–191, 1 fig. Dresden, December 1935.

In 1935 *Lyonetia clerkella*, L., was unusually abundant on apple and cherry in Germany. The moths oviposit on the leaves, and the larvae mine in them and pupate on their surface. Three generations a year are possible ; the adults of the last hibernate in cracks in the bark, between fallen leaves, etc. A tar distillate spray in early spring is recommended, and an arsenical spray in spring is also advisable. Bands of corrugated cardboard are said to attract larvae about to pupate.

Andersen (K. T.). **Experimentelle Untersuchungen über den Einfluss der Temperatur auf die Eierzeugung von Insekten. ii. Einfluss inkonstanter Temperaturen auf die Eierzeugung von** *Sitona lineata* **L. und** *Calandra granaria* **L.** [Experimental Investigations on the Influence of Temperature on Egg Production in Insects. ii.]—*Biol. Zbl.* **55** no. 11–12 pp. 571–590, 7 graphs, 4 refs. Leipzig, 1935.

In previous work the effect of constant temperatures on egg-production in *Sitona lineata*, L., was investigated [*R.A.E.*, A **22** 671]. This paper deals with the effect of changing temperatures on this weevil and on *Calandra granaria*, L. In *Sitona* the total egg-production and the duration of oviposition decreased as the females were kept for an increased length of time at 11–12°C. [51·8–53·6°F.], a temperature unfavourable to oviposition, before transfer to a higher and more favourable one. *C. granaria* was kept for periods varying from 5 days to 8 months at 12°C. It was found that too short or too long a stay in a temperature unfavourable to reproduction decreased the total and weekly number of eggs, the most favourable conditions being a stay of 3 months. No eggs were laid after 40–50 weeks at this temperature.

Börner (C.) & Schilder (F. A.). **Die Verbreitung der Reblaus in Deutschland nach dem Stande der Jahre 1934 und 1935.** [The Distribution of *Phylloxera* in Germany in 1934 and 1935.]—*NachrBl. dtsch. PflSchDienst* **15** no. 12 pp. 111–122. Berlin, December 1935.

Phylloxera was found on grape vines in 34 new localities in 1934 and in 51 in 1935. The leaf-form with a short proboscis extended its distribution in the German territory bordering on France. All hybrid vines should be cleared in order to check this spread.

Ripper (W. E.). **Notizen zur Schädlingsfauna Oesterreichs. II.** [Note regarding Pests in Austria. II.]—*Neuheiten PflSch.* **28** no. 6 p. 168. Vienna, December 1935.

In May the adults of *Maladera* (*Serica*) *holosericea*, Scop., ate holes in the leaves of young beet plants after they had been thinned, 2 or 3 beetles occurring on each plant in severe infestations. In August the larvae were found in the soil of lucerne fields feeding on the roots in association with *Otiorrhynchus ligustici*, L., and *Amphimallus solstitialis*, L. They pupated in the second half of August and the adults emerged in September.

In the early spring of 1933, and the autumns of 1934 and 1935, young wheat and rye plants were destroyed by the larvae of *Dilophus femoratus*, Mg. Up to 34 larvae per sq. ft. of ground were observed. There were 2 generations a year with flights in April–May and in August. The larvae of the second were found from September to March, but began to pupate in November.

HENGL (—). **Engerlingsbekämpfung im Wein- und Obstbau.** [The Control of Lamellicorn Larvae in Vine and Fruit Culture.]—*Mitt. burgenländ. LandwKammer* no. 4, 1935, p. 73. (Abstr. in *Neuheiten PflSch.* **28** no.6 pp. 176–177. Vienna, December 1935.)

In a grape-vine nursery at Eisenstadt, Austria, carbon bisulphide, injected into the soil at the rate of about 10 oz. per sq. yd., prevented all damage by Lamellicorn larvae without harming the plants. In strawberry beds 13 oz. per sq. yd. appeared to be satisfactory. Owing to the cost of this treatment, however, the chief measures recommended are collection of the adult beetles and destruction of the larvae when the soil is being cultivated.

PAPE (H.). **Ein Blattschädling an Staudenspiräen.** [A Leaf Pest on *Spiraea aruncus*.]—*D. Blumen- u. Pflanzenb.* **39** p. 342, 1935. (Abstr. in *Neuheiten PflSchutzes* **28** no. 6 p. 179. Vienna, December 1935.)

Larvae of the sawfly, *Pteronidea spiraeae*, Zadd., are recorded as skeletonising the leaves of *Spiraea aruncus* in Germany. Previously they had been recorded only on *S. palmata*.

EIDMANN (H.). **Zur Epidemiologie der Forleule.** [The Epidemiology of the Pine Noctuid.]—*Mitt. Forstwirt. Forstwiss.* 1934 pp. 13–27, 6 figs. (Abstr. in *Neuheiten PflSch.* **28** no. 6 p. 181. Vienna, December 1935.)

A ten-year periodicity of the pine Noctuid [*Panolis flammea*, Schiff.] has been observed in the chief regions of infestation in Germany and Russia. When a given population density has been exceeded, the outbreak collapses even if climatic conditions are favourable to an increase.

KORNFELD (A.). **Schädigungen und Krankheiten der Oelbohne (Soja), soweit sie bisher in Europa bekannt geworden sind.** [Injuries to and Diseases of the Soy Bean, so far as hitherto known in Europe.]—*Z. PflKrankh.* **45** no. 12 pp. 577–613, 25 figs., 21 refs. Stuttgart, 1935.

An extraordinary increase in the cultivation of the soy bean has occurred in Central Europe. In Rumania its area has increased 3,500 times in 4 years. This paper surveys the pests and diseases that have been observed, in Rumania unless otherwise stated.

Infestation by *Melolontha melolontha*, L. (*vulgaris*, F.) occurred, but can be avoided by preventing oviposition. In the flight-years (once every 3–4 years), the fields should be rolled smooth before the flight period and be ploughed and sown after its conclusion about mid-May. *Sitona lineata*, L., gnawed the leaves of quite young plants, causing serious losses in unmanured fields. Fields likely to be infested should

be manured to accelerate growth and a top dressing should be applied if the weevils appear. The springtail, *Bourletiella hortensis*, Fitch (*Smynthurus pruinosus*, Tullb.), was usually associated with the flea-beetles, *Chaetocnema tibialis*, Ill., and *Haltica oleracea*, L., and extended the injury done by them. All three were readily controlled by an arsenical dust. In 1935 there was in one locality a sudden, severe attack by the beet bug, *Piesma capitata*, Wolff [? *P. quadrata*, Fieb. (*cf. R.A.E.*, A **12** 438 ; **13** 65 ; **17** 640)], which had migrated to the soy beans from neighbouring weeds. Some instances of infestation by *Bruchus rufimanus*, Boh., and a very few by *B. pisorum*, L., were observed. *Mylabris pustulata*, Thunb., attacks the blossoms, infesting the bean fields in years in which swarms of locusts occur. In the Danube Delta soy beans were one of the crops attacked by locusts. *Pieris brassicae*, L., oviposited on soy beans, but only slight injury occurred, as the larvae migrated to other plants.

Vanessa cardui, L., has defoliated soy beans in Germany, the Melolonthid, *Apogonia destructor*, Bos, causes considerable damage to them in Java, and *Epicauta lemniscata*, F., is the chief pest in the United States.

O'Kane (W. C.) & Baker (W. C.). **Further Determinations of Oil Penetration into Insect Eggs. Studies of Contact Insecticides. IX.** —*Tech. Bull. N.H. agric. Exp. Sta.* no. 62, 8 pp., 16 refs. Durham, N.H., July 1935. [Recd. December 1935.]

The penetration of petroleum oil into eggs representing 6 orders of insects was studied by means of a technique already described [*R.A.E.*, A **23** 98]. The eggs showed traces of oil in the chorion, in layers underlying the chorion, or in tissues surrounding the globular contents or the developing embryo. There was a predominance of oil in the micropylar region, indicating that penetration was probably more rapid in that area.

O'Kane (W. C.) & Glover (L. C.). **Penetration of Arsenic into Insects. Studies of Contact Insecticides. X.**—*Tech. Bull. N.H. agric. Exp. Sta.* no. 63, 8 pp., 24 refs. Durham, N.H., July 1935. [Recd. December 1935.]

This paper begins with a brief review from the literature of the use of arsenic as a contact poison. In the experiments, which are described, dry powdered arsenic trioxide or sodium arsenite was confined in a small beeswax cell on the dorsal surface of the metathorax of adults of *Periplaneta americana*, L., from which a part of the wings had been removed in order to leave the full width of the dorsal metathorax exposed. After 10 days arsenic had passed through the integument, but no caustic effects were noted on the surface at the point of application. Cockroaches that died with the cell still attached began to disintegrate first in the thorax, and the decaying tissue in that region showed a characteristic red colour. In no case was marked paralysis noted. The insects usually moved about freely at first, but later became quiescent, although they were able to move their appendages. In the control experiments insects carrying empty cells were apparently normal after 2 weeks. Arsenic was recovered from all the organs and tissues examined, the largest amount being present in the digestive tract. The total arsenic content of the insects

was determined by the Gutzeit method in another series of experiments after 36 hours. It was found to be about 15 times, in the case of arsenic trioxide, and 5 times, in the case of sodium arsenite, the amount recovered in the control experiments where the arsenic was placed in the cell and then the cell and arsenic removed immediately without allowing time for it to penetrate extensively.

Wilkinson (D. S.). **Two new *Apanteles* (Hym. Braconidae).**—*Stylops* **4** pt. 12 pp. 266–269, 4 figs. London, 14th December 1935.

Apanteles menuthias, sp. n., is described from Madagascar, the host being unknown; and *A. hymeniae*, sp. n., from Fiji, where it was reared from *Hymenia recurvalis*, F. (*fascialis*, Stoll) on beet. A modification of the author's key [*R.A.E.*, A **21** 135] is made to permit the inclusion of *A. hymeniae*. *A. salutifer*, Wlkn., originally described from Siam, is here recorded as a parasite of Pyralids, including *Margaronia* (*Glyphodes*) *pyloalis*, Wlk., on mulberry, in Burma.

Decoux (L.) & Roland (G.). **Enquête internationale sur la pégomye de la betterave.**—*Publ. Inst. belge Amél. Better. Tirlemont* **2** no. 2 pp. 31–44, 12 refs. Brussels, 1934. [Recd. November 1935.]

A summary based on replies to a questionnaire is given of the occurrence of *Pegomyia hyoscyami*, Panz., in Belgium, Czechoslovakia, France, Germany, Italy, Russia, Denmark, England, Holland, Hungary, Spain, Sweden and the United States in 1933 and of the various methods employed for its control. It caused very little damage to beet in the last seven countries. Data concerning the factors affecting different stages are summarised from the more important papers published on the subject during 1933 [*R.A.E.*, A **21** 443; **22** 83, 211, 338].

Although the distribution of *P. hyoscyami* was extended in 1933, the intensity of infestation had somewhat abated. Most of the workers who had studied the fly in the infested countries agree that primarily the most effective methods of limiting injury are those that improve the vigour of the plants, but where the flies are present in large numbers sprays of sweetened sodium fluoride should be applied. There does not appear to be any variation in susceptibility among the different varieties of sugar-beet. Parasites together with climatic conditions are the most important factors limiting outbreaks. Parasites identified in Russia include *Alysia picta*, Goureau, and *Diachasma fulgidum*, Haliday, which do not appear to have been recorded from *P. hyoscyami* by the workers in other countries engaged on this study.

Zarco (E.). **Sobre el hallazgo en Santander de un coleóptero perforador de las cubiertas de plomo de cables telefónicos.** [On the Finding in Santander of a Beetle perforating the Lead Covers of Telephone Cables.]—*Bol. Soc. esp. Hist. nat.* **35** no. 3–4 pp. 143–146, 8 refs. Madrid, 12th April 1935.

Hylotrupes bajulus, L., is recorded as boring into the lead cover of a telephone cable at Santander. A perforation in a cable at Malaga is thought to have been due to *Sinoxylon sexdentatum*, Ol.

URQUIJO LANDALUZE (P.). **Desinfección de Semillas.** [Seed Disinfection.]—*Publ. Estac. Fitopat. agríc. Galicia* no. 6, 19 pp., text ill. Corunna, 1934. [Recd. December 1935.]

The second part of this paper deals with work against insect pests of stored seeds, those most common in Galicia being *Calandra granaria*, L., *C. zea-mais*, Motsch., and *Sitotroga cerealella*, Ol., in cereals and *Bruchus* (*Bruchidius*) *obtectus*, Say, in beans. Fumigation with carbon bisulphide is advised, and the method of doing this is described. Other, less effective fumigants are carbon tetrachloride and the fumes of burning sulphur. Uninfested seeds should be stored in bags dusted externally with a mixture of 1 part barium fluosilicate and 3 parts slaked lime.

GONZÁLEZ DE ANDRÉS (C.). **La " Polilla " de las Uvas** (*Polychrosis botrana*, **Schiff.**). [The Vine Moth, *P. botrana*.]—*Publ. Estac. Fitopat. agríc. Galicia* no. 8, 19 pp., text ill., 9 refs. Corunna, 1935.

The distribution of *Polychrosis botrana*, Schiff., in Spain is recorded, all stages are briefly described, and an account is given of the usual measures for control.

The adults from hibernating pupae of the third generation appear at the end of April and throughout May. The females live for about a week and oviposit on the flower-buds of the grape vine. The larvae of the first generation hatch throughout May, feed on the floral organs and small grapes and pupate in June, the adults emerging in 7–8 days. The adults of the second generation appear in July and part of August, and the larvae of the third occur in August and September, feeding on the ripening grapes and destroying the bunches.

Dibrachys cavus, Wlk. (*boucheanus*, Ratz.) has been recorded in Italy as parasitising *P. botrana*. In Galicia it has been observed in pupae of *Sitotroga cerealella*, Ol., and another host, *Apanteles glomeratus*, L., is common there.

Memoria de los trabajos realizados por la Estación de Fitopatología agrícola de La Coruña, años 1927–1933. [A Memoir of the Work of the phytopathological Station of Corunna, 1927–1933.]—*Publ. Estac. Fitopat. agríc. Galicia* no. 7, 81 pp., text ill. Corunna, 1934. [Recd. December 1935.]

This report includes a list (pp. 47–55) by C. González de Andrés of the insect pests of cultivated plants in Galicia, showing their food-plants.

Memoria de los trabajos realizados por la Estación de Fitopatología agrícola de La Coruña, año 1934. [A Memoir of the Work of the phytopathological Station of Corunna, 1934.]—*Publ. Estac. Fitopat. agríc. Galicia* no. 10, 79 pp., text ill. Corunna, 1935.

The chief pests of maize in Galicia in 1934 were *Pyrausta nubilalis*, Hb., and *Sesamia vuteria*, Stoll. Captive females of *P. nubilalis* laid most of their eggs on the lower surface of the leaves where they were more or less horizontal and so afforded protection from rain and sun. Sometimes the young larvae first fed on the leaf-tissue, but generally they at once entered the stalks. Only one annual generation was

observed, and the hibernating larvae suffered considerable mortality. The adults of *S. vuteria*, almost all of which had emerged by the end of May, oviposited beneath the sheaths of the leaves, and the larvae on hatching at once bored into the stalks. There was usually only one generation, and larvae of the second were quite small at the time of the harvest. Both *P. nubilalis* and *S. vuteria* were parasitised by the Tachinid, *Ceromasia senilis*, Mg., but *P. nubilalis* was apparently the preferred host.

Of the larvae attacking cabbage, *Pieris* (*Mancipium*) *brassicae*, L., and *P. rapae*, L., were the most harmful, though cases were also recorded of serious injury by *Plutella maculipennis*, Curt., *Barathra brassicae*, L., and *Athalia rosae*, L. (*colibri*, Chr.). The larvae of *Pieris* spp. were parasitised by *Apanteles glomeratus*, L., and the pupae by *Pteromalus puparum*, L. Each fertilised female of *A. glomeratus* could deposit up to about 40 eggs in the host; the larvae lived within it for 1–4 days, and then emerged to pupate. The pupal stage lasted 7–11 days except for the pupae that hibernated. The adults lived 1–6 days without food, or 30 and more if supplied with 10 per cent. sugar solution. When larvae of *P. brassicae* were placed in a cage containing adults of *A. glomeratus* kept for over 30 days, several cases of mating occurred among the latter. *P. brassicae* was the preferred host, and other species of *Pieris* were parasitised only when it was absent. A predominance of *P. rapae* therefore indicated the presence of *A. glomeratus*. The first adults of the latter sometimes emerged and died in spring before suitable host larvae were available. In one case a number of cocoons of this Braconid were destroyed by the Cetoniid, *Oxythyrea funesta*, Poda.

The proportion of the sexes was very variable in *Pteromalus puparum*. The females oviposited in pupae or in larvae about to pupate, and apparently more than one could oviposit in a given host. From 60 to 120 adults emerged from a host pupa. The life-cycle took less than 30 days in early summer.

Aphelinus mali, Hald., imported from Barcelona against *Eriosoma lanigerum*, Hsm., infesting apple, became established in Galicia, and a number of further distributions were made from native colonies. To free the roots of apple seedlings from *E. lanigerum*, they were dipped in an emulsion of 8 lb. wood tar and 3 lb. soft soap in 10 gals. water for 15 minutes at 20–40°C. [68–104°F.], but this treatment required supplementing by spraying the stem and branches at the end of winter. A soap solution containing 0·15 per cent. of pure nicotine was a suitable spray.

A list (pp. 61–71) is given of the diseases and pests reported in 1934; the majority of these records refer to insects.

Balachowsky (A.) & Viennot-Bourgin (G.). **Note sur le cycle évolutif du carpocapse dans la région parisienne.**—*C. R. Acad. Agric. Fr.* **21** no. 27 pp. 1018–1024, 1 ref. Paris, 1935.

The annual loss caused in France by *Cydia* (*Laspeyresia*) *pomonella*, L., may be estimated at about 200 million francs. In a locality near Paris in 1934 and 1935 there was practically only one generation a year, the larvae of the second occurring only in insignificant numbers. Overwintered larvae were observed as late as the end of July in 1934 and beginning of August in 1935, but a mean of 60 per cent. pupated between the 15th April and 15th May. The pupal stage lasted 10–12

days in the laboratory at 25°C. [77°F.] and 55 per cent. humidity, and usually 20–30 days in the open in May and June. In 1934, the emergence of the adults in rearings in the open continued almost uninterruptedly from 14th May to 18th August; but 75 per cent. appeared between 20th May and 25th June. In 1935, the first adults appeared on 5th June and there were two peaks in emergence, lasting from the 17th to 25th June and from 3rd to 10th July, after which only a few individuals emerged. In 1935, oviposition took place in an insectary in the open between 28th June and 11th July and only on warm, damp, still nights. The larvae hatched in about 6 days, and within 4 days most of them had penetrated into apples. They continued to feed for 3 weeks or a month, during which time many migrated from one apple to another. Almost all the larvae hibernated, but only 4 of several hundreds gave rise to moths in the year they were reared. These 4 moths emerged on 20th August.

Marchal (P.) & Regnier (R.). **Des conditions d'efficacité des traitements contre le carpocapse** (*Laspeyresia pomonella* **L.**) **en Normandie.**—*C. R. Acad. Agric. Fr.* **21** no. 29 pp. 1100–1107. Paris, 1935.

In Normandy the flights of *Cydia* (*Laspeyresia*) *pomonella*, L., usually take place during June and July, but according to trapping experiments using cider dregs with 5–10 per cent. vinegar as bait the times vary from year to year. Apparently a necessary condition is that the evening temperature should exceed 16°C. [60·8°F.] for three consecutive days. At the end of July the larvae emerged from infested fruit that had been picked, and made their cocoons; 98 per cent. went into diapause, while 2 per cent. emerged as moths in the middle of August. The last of the sprays used in the district (pre-blossom, petal fall and one 2–3 weeks later) is applied about the beginning of June. It is recommended that these sprays be based on the later flowering varieties of apples so that the last spray falls at the end of June or the beginning of July, during the time of flight of the moths. Experiments showed that arsenical sprays had little effect when applied to pears at petal fall (the end of April) and at the end of May, or to early apples at petal fall (mid-May) and in early June. When the second spray was given at the end of June the percentage of infested fruit was lower but still large; but when the sprays were given at the end of June and about 10th July, according to the temperature and trapping records, practically all the fruit was sound. Arsenical dusts had no effect when applied in the first fortnight in June, but when applied on 25th June and at the beginning of July gave complete control. Late apples seemed to be more attacked than late pears.

Marchal (P.) & Paillot (A.). **Nouvelles expériences sur le traitement des poiriers et pommiers contre la tavelure et la carpocapse.**—*C. R. Acad. Agric. Fr.* **21** no. 29 pp. 1108–1111. Paris, 1935.

In experiments in the Lyons district, a post-blossom spray of 1 lb. calcium arsenate in 20 gals. Bordeaux mixture applied on 17th April and again on 20th May gave good control of the first generation of the codling moth [*Cydia pomonella*, L.] on early varieties of pears. Later varieties and apples that were attacked by the second generation

had a considerable proportion of the fruit infested. Other plots of pears were sprayed with 2 lb. lead arsenate paste in 20 gals. Bordeaux mixture on 18th–24th April and again on 21st May. In all cases the percentage of infested fruit was 3–4 as compared with 30 or more on unsprayed trees. Corrugated cardboard bands impregnated with beta-naphthol and oil [*cf. R.A.E.*, A **20** 403 ; **21** 69] applied to the trees in the middle of August trapped an average of 7–8 larvae per tree where the trees had been sprayed with arsenicals, and 38 per tree on unsprayed trees. The percentage of larvae killed in the bands was 90–97. More larvae are trapped if the bark is levelled before the bands are applied.

Demolon (—) & Raucourt (M.). **Observations sur les produits utilisés en 1935 dans la lutte contre le doryphore.**—*C. R. Acad. Agric. Fr.* **21** no. 29 pp. 1111–1116, 6 refs. Paris, 1935.

The authors compare the efficiency of the different materials used in France for the control of the Colorado potato beetle [*Leptinotarsa decemlineata*, Say]. Owing to the unforeseen extension of the outbreak in 1935 [*cf. R.A.E.*, A **23** 632], a shortage of lead and calcium arsenate for the normal spraying programmes occurred, and non-arsenical dusts were used. Barium fluosilicate with 3 or 4 times its weight of a carrier, such as talc, gave initial results comparable with those of lead arsenate dusts. There is considerable variation in its composition, however, and apparently its effect is not so lasting. Powdered derris, containing 4·5–5 per cent. rotenone and mixed with 10–20 times the quantity of carrier, was also effective. It has similar disadvantages to the fluosilicate, and may possibly repel the insects so that many of the larger larvae return to the soil and pupate early.

Arsenical dusts are not authorised in France except for experimental purposes, although they are the most effective. Calcium arsenate dusts have the same toxicity as lead arsenate dusts and adhere better. In the concentrations used such dusts could not be harmful to men or animals [*cf.* **22** 460 ; **23** 703, 739].

Mayné (R.). **La situation des foyers doryphoriques en Belgique.**—*Bull. Soc. ent. Belg.* **75** no. 10 pp. 366–368. Brussels, 25th October 1935.

A table shows the distribution and dates of finding of the 30 recently discovered foci of *Leptinotarsa decemlineata*, Say, in Belgium, the numbers of potato plants attacked and the numbers of the various stages of the insect found [*cf. R.A.E.*, A **23** 739, 740]. The foci were only in the initial stage of infestation and were eradicated within 48 hours of discovery. One was at Limbourg, about 12½ miles from the Dutch frontier.

Turnbull (J.). **Spraying.**—*J. Minist. Agric.* **42** no. 9 pp. 865–870. London, December 1935.

The amount of pressure, and size of pump and lances required for spraying fruit-trees on a commercial scale with the fixed double nozzle already described [*R.A.E.*, A **22** 566] are briefly discussed.

Spoon (W.) & van der Laan (P. A.). **De beteekenis van het rotenongehalte bij de beoordeling van Derriswortel.** [The Importance of Rotenone Content in Judging Derris Root.]—*Ber. HandMus. kolon. Inst. Amst.* no. 98, 15 pp., 18 diagr. Amsterdam, 1935. (Repr. from *De Indische Mercuur* **58** no. 41, p. 625, 9th October 1935.)

The value of derris root is judged by two different standards, ether extract and rotenone content, on one or other of which market quotations are based. In experiments in Amsterdam to ascertain which standard is preferable, derris powders of known ether extract and rotenone content were tested, chiefly as dusts, on ants and Lepidopterous larvae. It was remarkable that these insects reacted uniformly, despite the wide divergences in their structure. Powders of approximately identical ether extract but differing in rotenone content gave dissimilar results, whereas powders of approximately identical rotenone content but differing in ether extract gave similar ones. To estimate the insecticidal value of derris, attention should therefore be directed chiefly to the rotenone content. With roots having a rotenone content of 4 per cent. and over, the amount of ether extract was unimportant, but with roots that contained less than 2 per cent. rotenone but yielded a large amount of ether extract, this last was important, toxicity here appearing to depend chiefly on the composition of the ether extract, which is as yet insufficiently known.

Kemper (H.). **Mehlkäfer als Schädlinge in einer Zigarrenfabrik.** [Flour Beetles as Pests in a Cigar Factory.]—*Mitt. Ges. Vorratsschutz* **11** no. 6 pp. 76–78, 1 fig. Berlin, November 1935.

In 1930 injury to cigars by *Tenebrio molitor*, L., was recorded from Germany [*R.A.E.*, A **18** 438]. In June 1934 a serious infestation was reported from a cigar factory in Westphalia. The building had been used as a flour mill, but was stated to have been thoroughly cleared of all remains of flour or grain. In feeding experiments the larvae ate tobacco leaf readily, though oat flakes, wheat flour and other suitable foods were available, but the adults never attacked tobacco even when starving.

Baranyovits (F.). **Bruchids in Peas and Lentils.** [*In Magyar.*]—*Köztelek* **45** no. 65–66. Budapest, 1935.

In Hungary, peas and lentils infested by Bruchids have been effectively fumigated in a cavity in the ground, roofed over with old boards over which a layer of soil, 12–16 inches thick, is spread. Carbon bisulphide is used at the rate of $\frac{1}{4}$ oz. per cu. ft., sacks soaked in it being placed over the bags of peas or lentils. The door is then shut and plastered with clay. The period of exposure is 24 hours. The threshed seeds should be treated as soon as they are air-dry, when the Bruchids are still in the larval stage.

Leleszi Kovách (G.). **The Control of the Rape Sawfly.** [*In Magyar.*]—*Köztelek* **45** no. 83–84. Budapest, 1935.

An instance of severe injury to rape by *Athalia rosae*, L. (*colibri*, Chr.) is recorded from Hungary. Arsenical sprays were not effective, as

they failed to adhere to the leaves even when adhesives were mixed with them. On the other hand arsenical dusts caused the injury to cease in 24 hours.

KADOCSA (G.). **The Cutworm on Crimson Clover.** [*In Magyar.*]—*Köztelek* **45** no. 85–86. Budapest, 1935.

In the past autumn in Hungary, *Euxoa* (*Agrotis*) *segetum*, Schiff., caused great injury to crimson clover [*Trifolium incarnatum*], which it does not usually attack. The moths were very abundant in August and September, and owing to drought in summer it had not been possible to plough stubble land in time, so that weeds attracted them to oviposit.

KÉLER (S.). **Szkodniki drzew leśnych obserwowane przez polskie stacje ochrony roślin w r.1932.** [Pests of Forest Trees observed by the Polish Stations of Plant Protection in the Year 1932.]—*Roczn. Ochr. Rosl.* (B) **2** fasc. 2 pp. 186–197, Warsaw, 1935. **Szkodniki drzew i krzewów leśnych i ozdobnych obserwowane przez polskie stacje ochrony roślin w r.1933.** [Pests of Forest and ornamental Trees and Shrubs observed by the Polish Stations of Plant Protection in the Year 1933.]—*T.c.* pp. 198–219.

MINKIEWICZ (S.). **Szkodniki sadów obserwowane w Polsce w r.1932.** [Pests of Orchards observed in Poland in the Year 1932.]—*T.c.* pp. 97–118. **Szkodniki sadów obserwowane w Polsce w r.1933.** [Pests of Orchards observed in Poland in the Year 1933.]—*T.c.* pp. 119–160.

RUSZKOWSKI (J. W.) & STRAWIŃSKI (K.). **Rośliny ozdobne i lekarskie obserwowane w Polsce w latach 1931–1933.** [Ornamental and medicinal Plants observed in Poland in the Years 1931–1933.]—*T.c.* pp. 161–176.

In these papers lists, arranged by food-plants, are given of pests, mainly insects, recorded from various districts in Poland, with brief notes on their local distribution and abundance, the stage observed, and the date of occurrence.

[BRUDNAYA (A. A.).] **Брудная (А. А.) Pests of the Jerusalem Artichoke and their Control.** [*In Russian.*]—*Bull. Res. Inst. Legume Gr. Crops* **6** no. 1 pp. 14–15, 156–197, 15 figs., 52 refs. Moscow, 1935. (With a Summary in English.)

Observations in various parts of the Russian Union in 1933 and 1934 showed that Jerusalem artichoke (*Helianthus tuberosus*) is attacked by 30 species of insects, of which 14 have not previously been recorded from this plant. As result of these investigations, and data from the literature, a systematic list is given of 88 Arthropods known to attack *H. tuberosus* in various countries. A separate list of the 30 insects found in the Russian Union shows the injurious stage of each and the part of the plant attacked. Brief notes on their bionomics and control are given, followed by instructions for the organisation of observations on them. A key to the pests, based on the type of the injury caused, is appended. None of the pests found in the Russian Union is specific to *H. tuberosus*, and all the important ones are polyphagous. Of these, the most injurious are the Elaterids, *Agriotes*

lineatus, L., and *Corymbites* (*Selatosomus*) *aeneus*, L., which reduce the quality of the tubers; and the weevil, *Tanymecus palliatus*, F., and the larvae of *Plusia* (*Phytometra*) *gamma*, L., and *Loxostege sticticalis*, L., which often destroy the leaves.

Hutson (R.). **Report of the Entomology Section for the Year ended June 30th, 1934.**—*Rep. Mich. St. Bd Agric. 1933–34* reprint 14 pp., 5 figs. East Lansing, Mich., 1934. [Recd. December 1935.]

An outbreak of *Chermes* (*Adelges*) *pinicorticis*, Fitch (pine bark aphis) occurred in a forest nursery in Michigan in the summer of 1933. Washing down the infested trunks with a fire hose gave very satisfactory results. *Anomala lucicola*, F., destroyed Austrian pines [*Pinus nigra* var. *austriaca*] in a conifer nursery. Lilacs were severely infested by *Podosesia syringae*, Harr., especially in nurseries and young plantings. Immediate control was obtained in autumn by painting a solution of paradichlorobenzene in raw cottonseed oil on the points attacked. *Corythucha marmorata*, Uhl., which usually occurs on golden-rod [*Solidago*], attacked chrysanthemums out-of-doors throughout the State, but wherever the infestation was not too advanced, control was easily obtained by a spray made by dissolving 1 tablespoonful nicotine sulphate in 1 U.S. quart hot strong soapsuds. Cheap yellow soap should be used, as it contains free alkali, and the spray should be applied immediately to avoid loss of nicotine. *Anasa tristis*, DeG., occurred in enormous numbers on squash and other cucurbits, and some growers killed the bugs by scattering a teaspoonful of calcium cyanide under each plant. It is recommended to plough under all crop remnants after the first hard frosts to destroy bugs about to enter hibernation. *Melittia satyriniformis*, Hb. (squash vine borer) also occurred in large numbers on cucurbits, the larvae tunnelling in the roots and the bases of the vines from the end of June. Fairly good control resulted from a spray of 3 lb. lead arsenate in 100 U.S. gals. Bordeaux mixture (4–4–50) applied to the stalks between mid-June and the end of July. Summer squash interplanted among the regular crop of winter squash has been found of value as a trap crop. Both *Brevicoryne* (*Aphis*) *brassicae*, L., and *Aphis pseudobrassicae*, Davis, were very abundant on cruciferous crops. A spray of 1 gallon summer oil and 1 pint nicotine sulphate in 100 gals. water was effective against them if applied at a pressure of about 200 lb. As an alternative, 4 per cent. fresh home-made nicotine dust gave satisfactory results where the fumes were confined for about 3 minutes by means of a large sheet. The severe outbreak of *Blissus leucopterus*, Say, that began in 1931 continued into 1934, being the first since 1894. During May and June 1934 *Systena taeniata* var. *blanda*, Melsh., attacked practically every crop other than tree fruit, with total loss of many fields of mint, beans and beet.

Poole (R. F.). **Arsenical Injury on the Peach.**—*Tech. Bull. N.C. agric. Exp. Sta.* no. 49, 13 pp., 1 pl., 5 figs., 2 graphs., 18 refs. Raleigh, N.C., May 1935. [Recd. December 1935.]

This is a more detailed account, with references to the literature, of the injury caused to peaches by lead arsenate sprays and of the results of studies in North Carolina on its control [*cf. R.A.E.*, A **22** 32]. Although the injury is much worse in wet seasons, temperature,

as shown from records for 1932–34, appears to have no effect. In some tests, fused bentonite sulphur, flotation sulphur, and sulphur dusts gave some reduction in injury, but the results have not been consistent, and injury has been severe irrespective of the type of sulphur used. Amounts up to 10 and 15 lb. in 50 U.S. gals. water have been used but larger amounts did not increase the control. In 1934 there was much less injury on trees sprayed with bentonite sulphur at the rate of 3 and 5 lb. in 50 U.S. gals. of the spray mixture than at 1 and 2 lb. The leaves remained throughout the season on trees sprayed with 4 lb. zinc sulphate, 5 lb. hydrated lime and 1 lb. lead arsenate. Without the lime the same spray caused 50–75 per cent. defoliation. Additional applications of 10 lb. lime in 50 U.S. gals. water after the injury was first observed slightly reduced the injury but were not satisfactory. Zinc sulphate and lead arsenate, given after lead arsenate and lime had been applied twice, reduced the injury on fruit and leaves but was less efficient than zinc sulphate used in all sprays after the buds opened. It is concluded that the addition of zinc sulphate to the early sprays is of the greatest importance, and that it should be used in all sprays containing lead arsenate.

Entomology.—*Bull. Ohio agric. Exp. Sta.* no. 548 (Rep. 1933–34) pp. 39–45. Wooster, Ohio, April 1935. [Recd. November 1935.]

[C. R.] Cutright reports that owing to high temperatures and low rainfall in Ohio during the growing season of 1934, injury to apples by *Cydia* (*Carpocapsa*) *pomonella*, L., increased in almost all sections of the State. A count of infested fruit on 20 banded trees showed that 11 per cent. of the larval population was trapped in the bands at harvest. The percentage of damaged fruit varied from 4 to 23 on 5 varieties, showing that they differ in susceptibility. New combinations of nicotine sulphate and bentonite sulphur, used with and without spreaders, were not so effective as lead arsenate, but when two applications were substituted for each one of lead arsenate the results were much improved. Two applications of nicotine tannate and bentonite sulphur in place of one of arsenate were also quite effective. Calcium arsenate was better than zinc arsenate (4 lb. each in 100 U.S. gals. water) and both were more effective than lead arsenate (3 lb.). Cuprous cyanide, with and without oils, gave good control but severely injured the fruit of some varieties.

A study by C. R. Neiswander of the occurrence of the adults of *Lachnosterna* (*Phyllophaga*), the larvae of which cause injury to lawns, showed that the beetles were abundant in 1932 and 1934 but scarce in 1933. The most important species in the order of abundance were *L. hirticula*, Knoch, *L. fusca*, Fröl., *L. rugosa*, Melsh., *L. tristis*, F., *L. fraterna*, Harr., and *L. fervida*, F. Other species taken included *L. inversa*, Horn, *L. ilicis*, Knoch, *L. anxia*, Lec., *L. futilis*, Lec. (*gibbosa*, Burm.), *L. hirsuta*, Knoch, *L. forsteri*, Burm., and *L. villifrons*, Lec. Lead arsenate at the rate of 5 lb. to 1,000 sq. ft. reduced the total grub population by 40·5 per cent. and the first year grubs by 66 per cent.

In tests on the susceptibility of varieties of onions to *Thrips tabaci*, Lind. [*cf. R.A.E.*, A **23** 93], [J. P.] Sleesman found that the mean thrips population per plant of the 2 most resistant varieties was 2·23

for White Persian and 12·00 for Sweet Spanish as compared with 162·23 for one of the least resistant varieties.

Of 13 materials used in field trials by Sleesman and [H. L.] Gui for the control of *Empoasca fabae*, Harr., on potatoes, Bordeaux mixture (4 : 6 : 50) and dusts of copper sulphate and lime (20 : 80) and of sulphur and pyrethrum given at intervals of 10–12 days were the most satisfactory. On potatoes planted on 22nd May, Bordeaux mixture reduced the leafhopper population by 90 per cent., the copper-lime dust by 88 per cent. and the sulphur-pyrethrum dust (0·09 per cent. pyrethrin) by 93 per cent. The average yields were 347, 345 and 332 bushels per acre, respectively. For potatoes planted 20th June, the percentage control was 84 for Bordeaux mixture, 88 for sulphur-pyrethrum dust (0·0225 per cent. pyrethrin) and 53 for wettable sulphur, and the yields per acre were 287, 270 and 227 bushels respectively.

[J. S.] Houser and R. B. Neiswander state that *Rhynchaenus* (*Orchestes*) *pallicornis*, Say, has recently increased on apple, particularly in orchards having a heavy grass sod beneath the trees. Two applications of 5 lb. Dutox [barium fluosilicate], 8 lb. flotation sulphur, and 3 oz. goulac [dry lignin pitch] in 100 U.S. gals. water applied in the pre-pink and pink bud stages gave a significant degree of control and appeared to be superior to lead arsenate and lime-sulphur. Both the lower and upper surfaces of the leaves should be sprayed.

Houser and [L. L.] Huber report that *Blissus hirtus*, Montd., seriously damaged lawns in one locality. Lawns of bent grass and in sunny places were the most damaged. Huber also states that infestation of maize by *Pyrausta nubilalis*, Hb., was considerably lower than in 1933.

According to R. B. Neiswander, injury to peaches by *Cydia* (*Grapholitha*) *molesta*, Busck, was relatively light in spite of a light crop. In most orchards the percentage of parasitism was high. *Macrocentrus ancylivorus*, Rohw., was the most effective species, giving 84 per cent. parasitism. *Angitia* (*Dioctes*) *molestae*, Uch., and *Microdus* (*Bassus*) *diversus*, Mues., were liberated in various parts of the State, and *M. ancylivorus* in localities where it had not become established.

Investigations were undertaken by Gui and Sleesman on the control of *Plusia* (*Autographa*) *brassicae*, Riley, *Pieris* (*Ascia*) *rapae*, L., and *Plutella maculipennis*, Curt., on cabbage. Dusts gave better control than sprays. Of 23 insecticides tested, the most efficient, in the order of superiority, were : Paris green, hydrated lime and flour (1 : 2 : 5) ; Paris green and hydrated lime (1 : 7) ; derris powder (5 per cent. rotenone), pyrethrum powder and diatomaceous clay (1 : 4 : 5) ; barium fluosilicate and flour (1 : 7) ; and derris powder (5 per cent. rotenone) and diatomaceous clay (1 : 9).

Dean (G. A.) & Smith (R. C.). **Insects injurious to Alfalfa in Kansas.** —*Bienn. Rep. Kans. Bd Agric.* **29** pp. 202–249, 39 figs., 1 ref. Topeka, 1935.

This paper is a revision of a previous one [*R.A.E.*, A **5** 72]. The following additional pests of lucerne are included : *Macrosiphum onybrychis*, Boy. (*Illinoia pisi*, Kalt.), *Epicaerus imbricatus*, Say, *Chorizagrotis auxiliaris*, Grote, *Caenurgia erechtea*, Cram., *Heliothis armigera*, Hb. (*obsoleta*, F.), *Plathypena scabra*, F., *Loxostege sticticalis*, L., and *Pyralis farinalis*, L. The last-named attacks the lucerne hay in ricks or stores.

DA COSTA LIMA (A.). **Sobre dois microhimenopteros parasitos de ovos de** *Mormidea poecila* **Dall.** [On two Microhymenoptera parasitising the Eggs of *M. poecila*.]—*Campo* **6** no. 2 repr. 2 pp., 1 fig. Rio de Janeiro, February 1935. [Recd. December 1935.]

The Scelionids, *Telenomus mormideae*, sp. n., and *Dissolcus mormideae*, sp. n., are described from Brazil, where they parasitise the eggs of *Mormidea poecila*, Dall. This Pentatomid has been found attacking rice and seems likely to become a serious pest.

DA COSTA LIMA (A.). **Um Drosophilideo predador de Coccideos.** [A Drosophilid attacking Coccids.]—*Chacaras e Quintaes* **52** no. 1 repr. 4 pp., 3 figs., 4 refs. S. Paulo, July 1935. [Recd. December 1935.]

A wing and the male terminalia are figured of the Drosophilid, *Rhinoleucophenga obesa*, Lw., found parasitising *Aclerda campinensis*, Hemp., on sugar-cane near Rio de Janeiro. This is the first Drosophilid observed to parasitise Coccids in Brazil.

GONÇALVES (C. R.). **Sobre a biologia di** *Sitophilus linearis* **(Herbst) (Col. Curcul.).** [On the Biology of *Calandra linearis*.]—*Rev. Ent.* **5** no. 4 pp. 414–420, 7 figs., 5 refs. Rio de Janeiro, 30th November 1935.

Calandra (*Sitophilus*) *linearis*, Hbst., is very common in Rio de Janeiro in the seed pods of *Tamarindus indica*. Its biology in Brazil is similar to that described in Florida [*R.A.E.*, A **9** 183] except that the egg stage lasts 5 days and the larval 22. A key to the three species of *Calandra* (*Sitophilus*) occurring in Brazil, *viz.*, *C. linearis*, *C. oryzae*, L., and *C. granaria*, L., is given.

Two Scolytids, *Pityophthorus peregrinus*, Eichh., and *Hypothenemus* sp., and a Lamiid, *Lophopoeum timbouvae*, Lam., also attack the seeds of *Tamarindus indica*.

LOPES (H. de Souza). **Sobre duas especies de** *Sarcophaga* **cujas larvas são predadoras (Dipt. Sarcophagidae).** [On two Species of *Sarcophaga* with predacious Larvae.]—*Rev. Ent.* **5** no. 4 pp. 470–479, 16 figs. Rio de Janeiro, 30th November 1935.

Descriptions are given of *Sarcophaga larvicida*, sp. n., and *S. larvivorax*, sp. n., from Brazil. The larvae of these Sarcophagids prey on other larvae placed with them, even of the same species.

COTTIER (W.). **Aphides affecting Cultivated Plants. (6) The Black Citrus Aphid and some other Tree Aphides.**—*N. Z. J. Agric.* **51** no. 4 pp. 214–219, 3 figs. Wellington [N.Z.], 21st October 1935.

This paper is the last of a series on Aphids in New Zealand [*cf. R.A.E.*, A **23** 692, 724] and includes notes on *Eriosoma lanuginosum*, Htg., on European elm and pear [**23** 165]; *Rhopalosiphum* (*Neomyzaphis*) *abietina*, Wlk., on spruce [**20** 377]; and *Myzocallis castanicola*, Baker, which occurs on oaks but does no economic injury.

Aphis citricidus, Kirk., which is the common black Aphid on *Citrus* in New Zealand, overwinters in its normal summer stages with greatly retarded development. It is heavily parasitised, but further control

is given by a spray of 1 pint nicotine sulphate and 3–4 lb. soft soap in 100 gals. water. Summer oil spray (1 : 60), which is used for red scale [*Aonidiella aurantii*, Mask.] on *Citrus*, controls the Aphid also.

Pemphigus populitransversus, Riley, causes galls on the petioles of poplar leaves. Winged forms from these galls migrate to crucifers in late summer and autumn and produce colonies of wingless Aphids that migrate to the roots, where they overwinter. In the spring, winged sexuparae return to the poplars where they produce the only sexual generation, the female of which lays a single egg. The Aphids from these eggs initiate the galls. This Aphid does no economic damage in New Zealand. The winged and wingless viviparous females of all these Aphids are briefly described.

Pescott (R. T. M.). **The Currant Borer Moth (*Aegeria tipuliformis* Clerck).**—*J. Dep. Agric. Vict.* **33** pt. 10 pp. 497–498, 4 figs., 2 refs. Melbourne, October 1935.

Aegeria tipuliformis, Cl., has spread to several areas in Victoria since 1927 [*R.A.E.*, A **15** 242] and may become a serious pest. Black currant is the preferred food-plant, but red and white currants, gooseberry and raspberry are also attacked. There is only one generation a year. The almost mature larvae hibernate inside the canes a short distance from the ground, but feed for a short time in spring before pupating. The adults (which are briefly described) emerge in the spring during the months of October, November and December, and the eggs are usually laid on young wood close to the buds. The larvae hatch in about a fortnight and immediately bore into the canes. They work downwards through the pith until finally they may reach the roots. Infested canes can only be distinguished in early spring, when their new leaves are yellowish and undersized and they usually die within 2–3 weeks. All canes and twigs showing the general symptoms of dying back should be cut out at ground level in early spring (before October) and burned immediately.

Ward (K. M.). **The Green Peach Aphid. Further Observations.**—*J. Dep. Agric. Vict.* **33** pt. 10 pp. 500–506, 3 figs., 4 graphs, 2 refs. Melbourne, October 1935.

Field experiments with winter sprays against *Myzus persicae*, Sulz., on peach in Victoria [*cf. R.A.E.*, A **22** 482] were continued in two localities in the Goulburn Valley in the first half of July 1934. The ovicides used were 2 and 3 per cent. tar distillates, 5 per cent. red oil and 10 per cent. lime-sulphur. All the sprays decreased the infestation considerably, but whereas in one locality there was no significant difference between the effectiveness of the spray materials, in the other commercially satisfactory control was given only by the 3 per cent. tar distillate, and the red oil and lime-sulphur were less effective than the 2 per cent. tar distillate.

Factors causing outbreaks are discussed, and the existence of a relationship between the abundance of the Aphid and certain climatic conditions is pointed out. Observations over a number of years indicate that in the Goulburn Valley the outbreaks are associated with heavy summer rainfall and the absence of high temperatures during September and October. The former condition stimulates the growth of certain plants that provide food for the Aphid in summer

and early autumn, as a result of which a large migrating population can develop prior to the laying of winter eggs, and moderate temperature in the spring probably permits the insects to breed without interruption and results in a high survival rate [*cf.* **15** 259 ; **17** 652]. No outbreaks are likely to occur in years in which the summer and autumn are dry and high temperature prevails on a number of succeeding days in September and October.

HARGREAVES (H.). *Stephanoderes hampei* **Ferr., Coffee Berry-borer, in Uganda.**—*E. Afr. agric. J.* **1** no. 3 pp. 218–224, 12 figs. Nairobi, November 1935.

A general account is given of the bionomics of *Stephanoderes hampei*, Ferr. (coffee berry borer) in Uganda [*cf. R.A.E.*, A **14** 224]. The females outnumber the males by 10 to 1. The preoviposition period of the female is 5–30 days, and 60 or more eggs are laid in 12 weeks. Two parasites, *Heterospilus coffeicola*, Schmied., and *Prorops nasuta*, Wtstn., normally keep the pest in check. The preoviposition, larval and pupal periods of *P. nasuta* are 2½ weeks, 3–4 days and 2½–3 weeks respectively ; and the maximum length of life of a female was 65 days. The female lays up to 37 eggs at a rate of 2–½ per day. *H. coffeicola* probably lays only one egg in each infested berry. The cultivation of small blocks of *Coffea robusta* and *C. arabica* alternately appears to favour the parasites [*cf.* **14** 225], as do the elimination of shade and maintenance of open growth of the coffee trees. If borer incidence is low, the fallen berries should not be removed, as they contain a high percentage of *P. nasuta*.

JOHNSTON (H. B.). **A new Grasshopper (Acrididae, Cyrtacanthacrinae) from the Sudan.**—*Ann. Mag. nat. Hist.* (10) **16** no. 96 pp. 600–601, 1 pl. London, December 1935.

Cyrtacanthacris sulphurea, sp. n., both sexes of which are described, was taken feeding on *Sorghum* in the Anglo-Egyptian Sudan. In one locality it is reported to become occasionally a minor pest of grain crops.

BEESON (C. F. C.). **Control Measures for Termites.**—*Indian For.* 1934 pp. 64–78, 1 pl. Calcutta, January 1934. [Recd. November 1935.]

This paper summarises the control methods used against termites as pests of timber and living trees in all parts of the world, and lists the timbers that are resistant to attack in India, Ceylon and Malaya. Details are given of the termite-proof construction of buildings.

BEESON (C. F. C.). **The Rôle of Insects in the Dying-off of Sal** (*Shorea robusta*).—*Indian For.* 1935 pp. 539–543. Calcutta, August 1934. [Recd. November 1935.]

Insects associated with dying saplings, poles and trees of *Shorea robusta* in India are divided into three groups according to whether they bore in the bark or wood, cause defoliation or suck the sap. Only one species of borer, the Cerambycid, *Hoplocerambyx spinicornis*, Newm., is capable of attacking and killing healthy trees of any age and size, although it normally breeds in freshly felled timber, windfalls, etc.

Attacked trees die off from the crown downwards by sudden withering of the foliage in spring or autumn, and exude resin profusely at points where the larvae bore in the bark, though the roots remain healthy. Remedial measures include the removal of attacked trees before the next monsoon, collection of beetles in July–August and utilisation of trap-trees. A list is given of a large number of secondary borers, which, though incapable of killing healthy trees, can, under certain conditions, accelerate the death of moribund trees. These bore in the bark and wood of crown and branches, and some species of *Xyleborus* and some weevil and Prionid larvae bore into the roots, often to considerable depths below ground-level. Dying-off, when due to secondary borers, is preceded by drying-up of the crown without sudden withering of the foliage ; no resin is exuded at oviposition points and the roots are dead in parts or diseased, the wood being invaded by hyphae. The bark remains closely attached to the bole or separates loosely in patches with discolouration of the sapwood. Of these borers, *Sphaerotrypes siwalikensis*, Stebb., requires fresh moist bark for its brood tunnels, as the brood fails to develop under dry conditions, and in healthy trees a flow of resin drives out or kills the beetles. *Acmaeodera stictipennis*, Lap. & Gory, *Chrysobothris beesoni*, Obenb., *Sinoxylon anale*, Lesne, and *Xylotrechus smei*, Lap. & Gory, are associated with stag-headed and dried out crowns, and *Aeolesthes holosericea*, F., *Diorthrus cinereus*, F., and *Coptops aedificator*, F., are found in the larger branches and boles of trees thus affected. The occurrence of these species in the absence of others suggests that the trees either died of drought or were attacked after the crown and bole had begun to dry out. The presence of the Tineid borer, *Gerontha captiosella*, Wlk., is associated with a saprophytic bark fungus, *Hypoxylon annulatum*, which produces a charcoal-like formation beneath the outer dead bark easily mistakeable for scorching by ground fires. Dying-off with drought as the sole predisposing factor is rare, as there are usually complications in the shape of root diseases. Dying-off in localities of high rainfall or under normal weather conditions is mainly associated with *Diapus furtivus*, Samps., *Crossotarsus saundersi*, Chap., *Xyleborus* spp., *Dialeges pauper*, Pasc., and *Xylotrechus buqueti*, Lap. & Gory. Attack by *Hoplocerambyx spinicornis*, as a secondary borer, indicates an unresistant condition in the tree at the beginning of the rains. Secondary borer attack is distinguished from primary attack in regions of high rainfall by the diversity of the incidence of the constituent species. The successful application of remedial measures against secondary borers saves the timber but does not stop dying-off.

A large number of species of Lepidoptera defoliate *Shorea*, the greatest variety occurring in wet type forests in Assam and Bengal, but even in the case of prolonged outbreaks do not cause dying-off on a large scale. *Drosicha stebbingi*, Green, is the only sap-sucking insect that appears in great numbers, and there have been no recent records of wholesale mortality as the result of mass attacks by this Coccid. It is, however, responsible for stag-headedness and is followed by secondary borer attack. Excessively rapid growth in coppice shoots and saplings sometimes causes longitudinal fissures in the bark, which are invaded by termites, the Coccid, *Pedroniopsis beesoni*, Green, and stem rots, which prevent healing and accelerate death.

The primary causes of dying-off are probably referable to physiological disturbances resulting from meteorological conditions.

Beeson (C. F. C.). **The Biological Control of Teak Defoliators.**—*Indian For.* 1934 reprint 12 pp. Calcutta, October 1934. [Recd. November 1935.]

The chief insects that defoliate teak in India are *Hyblaea puera*, Cram., and *Hapalia machaeralis*, Wlk., both of which have 13–15 generations a year in the south and 8–10 generations a year in the north. So long as the environment of the teak plantation remains constant, the populations of these defoliators are kept in a state of balance by parasites, predators and diseases, but the clearing and burning over of areas for regeneration destroys the complex that controls the pests. Re-population by the defoliators, which is possible as soon as their food-supply is available, is more rapid than re-population by their natural enemies. The unfavourable effect can be nullified by interspersing the regeneration areas with strips or patches in which the pre-existing vegetation is retained and fire excluded. Teak should not be planted close to rivers or large streams as this results in profuse production of new foliage in exposed situations. Permanent agricultural land near or within plantations is not undesirable, as the natural enemies released by the rotation of crops disperse into the adjoining forest. The burnt block should have an area of 20–40 acres, no part of which should be more than 400 yds. away from unburnt forest, and the width of the dividing strip should be just sufficient to ensure its protection from fire.

The penetration and colonisation of the planted area can be accelerated by creating a favourable environment for parasites and predators. This can best be effected by the establishment of a varied flora under the teak canopy by the retention of coppice regrowth and miscellaneous seedlings, rather than by introduction of selected species of plants at a later stage. A list is given of plants that are useful in small proportions as undergrowth. *Callicarpa* spp., *Premna latifolia* and *Vitex negundo*, which serve as alternative food-plants, should be eliminated from undergrowth and the vicinity of the plantations. If the average density of the defoliators established by these measures exceeds that at which economic damage begins, supplementary measures, including the introduction of parasites and predators that are not already established must be resorted to. A survey in Burma and India has shown that *H. puera* has 22 species of parasites and *H. machaeralis* 43, of which 5 are common to both, the distribution of the 60 species being very irregular. In localities where there is a poverty of natural enemies, the introduction of selected species can produce beneficial results, if due regard is given to their reactions to changes in density of their hosts. Specific parasites control their hosts at low densities provided that the life-cycles of both coincide, but they tend to produce oscillations by which the host population is broken up into widely separated small groups, which are the nuclei of a subsequent increase. As the densities of teak defoliators are subject to violent fluctuations, specific parasites are unlikely to maintain effective economic control. Polyphagous parasites are more effective, provided that their alternative hosts occur so that they can maintain their numbers on them. Predators, which have annual life-cycles or periods of activity adjusted to the seasons, can form the reserve force that is an essential auxiliary to parasite action. One species of parasite, the habits of which have been well studied, should be introduced at a time so that its effect can be studied, additional

species being brought in later. The first species to receive attention should be the 5 parasites common to both hosts, and among predators the first kinds to be colonised are Mantids, Carabids and Reduviids. A methodical record of the frequency and intensity of defoliation is necessary for the proper evaluation of the results of liberation.

BEESON (C. F. C.). **Boxwood Borers** (*Heterobostrychus*).—*Indian For.* 1935 pp. 250–255. Calcutta, April 1935. [Recd. November 1935.]

A brief account is given of the bionomics of 4 species of *Heterobostrychus* and 3 allied Bostrychids that attack stored timber (including plywood, the wood of boxes, etc.) in India, with lists of the trees the timber of which is attacked by each.

H. aequalis, Waterh., which is the commonest species, is also found in Burma and Ceylon, and has been recorded from the wood of 25 species of trees. Eggs are laid on the rough surfaces of sawn timber and barked logs, in natural cracks and holes, or in short tunnels in the wood made by the female. The larval tunnel may gradually widen to as much as $\frac{1}{4}$ in. and may extend for 10–12 ins. It is generally very winding and intersected by other tunnels and is tightly packed with the undigested residue of the wood eaten by the larvae. This fine dust distinguishes the tunnels of *Heterobostrychus* from those of pinhole and shothole borers, which contain no residue. The tunnels made by the larvae of *Lyctus* spp. are smaller both in length and diameter. The larva pupates in a cell at the end of the tunnel, and the adult remains within the wood for a variable period before finally emerging by an exit-hole at the surface. Emergence takes place mainly during the monsoon season (June to October) and, in an insectary, reached its maximum in July when about 45 per cent. of the beetles emerged. During the rest of the year not more than 7 per cent. leave the wood. Development from egg to adult requires a minimum of 1 year but usually many of the larvae from eggs laid in one season take 2 or 3. The longest period recorded was 5 years in plywood, and 6 years in opium chests of semul [*Bombax malabaricum*]. When barked logs are heavily attacked, the wood may be reduced to powder to a depth of 2 or 3 ins. except for a residual skeleton. In soft woods the damage may extend deeper, but in hard woods with a well-marked heart the damage is confined to the sapwood. In plywood panels, the tunnels are confined to one sheet of ply by the intervening glued layer. Emerging beetles will bore through a thickness of 1–2 ins. and will also make holes through the lead foil of tea boxes.

H. hamatipennis, Lesne, occurs throughout India, Burma, Indo-China and Ceylon and is known to attack the timber of 11 species of trees. Its life-cycle is similar to that of *H. aequalis*, Waterh., requiring a minimum of 1 year, and it emerges mainly in June and July. The longest period recorded before emergence was 2 years. *H. pileatus*, Lesne, which is found in India and Indo-China, is a forest species rather than a store and warehouse pest, and has been recorded from 11 species of trees. Its life-cycle is annual, but it emerges chiefly between April and May, over 70 per cent. emerging in April. *H. unicornis*, Waterh., is a rare species and has only been recorded from *Butea frondosa* and *Shorea robusta*.

Three beetles closely similar to *Heterobostrychus* in appearance and habits are *Bostrychopsis parallela*, Lesne, *B. bengalensis*, Lesne, and

Schistoceros anobioides, Waterh. *B. parallela* occurs throughout India, Indo-China and Malaya as a borer of dry bamboos, especially when used for tent poles and army telegraph poles. The life-cycle is annual but is frequently prolonged to 2 or 3 years, the longest record being 6 years in stored bamboo tent poles. Almost all the beetles emerge between June and September. It has occasionally been found boring softwoods in India and Dipterocarps in the Philippines, but this appears to be abnormal. *B. bengalensis* is a much rarer species that also bores in bamboo tent poles. The adults emerge in June and July. *S. anobioides* is found throughout the Indian region as a borer of poles and the sapwood of logs of 12 species of trees, and unidentified woods used for tent-pegs. The life-cycle is usually annual, but occasionally, as in tent-pegs alternately exposed to the weather and then stored in the dry, it may last 3 years. Emergence takes place between March and July with 30 per cent. emerging in May and 20 per cent. in June.

The best method of protecting logs from damage is extracting and converting them early. Trees felled between November and April are usually little attacked, but those felled at the end of the hot weather and during the rainy season should be extracted and converted as soon as possible. If extracted by floating in water they are safe as long as they are submerged. Sawmills, factories and storage depots should be inspected once a year and all infested wood burnt. In badly infested localities freshly-cut waste pieces of semul or mango should be distributed about the premises in July to catch any stray beetles and then burnt in December. Plywood made from infested logs is automatically sterilised during the processes of peeling and glueing, so that damage is not carried on to the panel. Plywood panels finished in November or later are not liable to be attacked until the rainy season. Panels that must be stored for more than 6 months or throughout the rains can be protected by strapping them up in units forming a cube, boxed in by panels on all sides, and stacking the cubes with narrow battens between the vertical tiers. Glues for veneers usually contain an antiseptic such as sodium fluoride. Five per cent. of sodium fluoride added to the dry mix checks the passage of larvae from one veneer to the next.

Beeson (C. F. C.). **Cockchafers and Conifers.**—*Indian For.* 1935 pp. 374–377. Calcutta, June 1935. [Recd. November 1935.]

Investigations made in the Punjab in 1934 and in the United Provinces in 1932–34 of the importance of cutworms and cockchafers as factors causing the dying-off of seedlings and young plants of conifers in the western Himalayas show that damage from cutworms, usually attributed to *Agrostis ypsilon*, Hfn., is limited to young seedlings and to a period of a few weeks in the spring immediately after the snow has disappeared from the seed-beds. Damage assigned to cockchafer grubs affects seedlings and transplants up to 3 years old, the percentage of injury varying from 1 to 100. About 47 species of Catoniid, Melolonthid and Rutelid larvae were discovered at elevations between 3,000 and 9,000 ft., and 17, a list of which is given, were found in seed-beds and forest nurseries or in the soil between beds.

A Melolonthid of the genus *Granida*, the largest species of cockchafer grub occurring in seed-beds, also lives in soil varying from poor micaceous earth to black humus, is found up to 9,000 ft. and occurs in open places in high forest as well as in cultivated land lying fallow.

Melolontha furcicauda, Ancey, and the Rutelid, *Mimela pectoralis*, Blanch., are also characteristic of seed-beds. Grubs do not occur in new seed-beds made up after the monsoon, but oviposition takes place in beds worked up in July or June. The grubs carry over the fallow period in organic matter in the soil and attack seedlings when the beds are resown in December. Beds of raw mineral sub-soil are ordinarily free from cockchafer damage. The larvae of *Granida* and allied species cut through the tap roots of seedlings at any point between the surface and a depth of 2 inches. Damage by grubs, which is often concentrated in a few adjacent beds while the rest of the nursery is immune, begins in April and is most severe in May. Pupation begins about the middle of June. In most nurseries 50–100 per cent. of mortality among seedlings can be ascribed to causes other than insects. Fine seedlings killed by cockchafer larvae can be easily withdrawn from the soil by a vertical pull, whereas those having died from other causes first resist and then break suddenly. Mortality in regeneration areas inspected in the Punjab in 1934 was in no case due to insects, and much of the mortality in transplanted trees, at first sight attributed to cockchafer injury, was found to be the result of mechanical damage to the roots at the time of transplanting.

In the United Provinces not more than 13 per cent. of the total mortality found was due to cockchafers and no insect damage was observed on healthy plants.

It is concluded that soil insects are of much less importance than other factors in causing the death of conifers between the ages of 6 and 30 months and that no special control measures against them are warranted. In seed-beds, however, control measures against cockchafers are sometimes required. In the case of monsoon sowings, measures are necessary to prevent oviposition in soil worked up during the flight period of the beetles. Experiments to discover a material effective as a top dressing against oviposition are in progress.

BEESON (C. F. C.). **Forest Protection : Insects (India).**—*4th Brit. Emp. For. Conf. S. Africa 1935*, reprint 8 pp. Calcutta, 1935.

Measures by which economic control of pests can be achieved in the temperate, subtropical and tropical forests of India under existing conditions of management are summarised. Insect pests of forests are divided into defoliators, borers of living trees and of timber and soil insects. Single generation defoliators, which are practically confined to forests of high elevation (above 5,000 ft.), are well controlled by natural enemies, and measures against them consist mainly of direct destruction, such as collection of accessible bags of *Clania crameri*, Westw., which has a prolonged larval period on pine, and grease banding for *Malacosoma indica*, Wlk., which attacks oak and aestivates and hibernates as an egg. Against *Ectropis deodarae*, Prout, which defoliates deodar and has a wingless female, the needle litter in which hibernation takes place during the pupal period is compacted into heaps, and grease bands are applied in spring. Direct action is impossible against defoliators having several generations, such as *Hyblaea puera*, Cram., and *Hapalia machaeralis*, Wlk., on teak. Preventive measures against the Noctuid, *Plecoptera reflexa*, Gn., and the Tineid, *Dichomeris eridantis*, Meyr., recurrent outbreaks of which occur in irrigated plantations of shisham (*Dalbergia sissoo*) are : the provision of an adequate water supply ; formation of open stands from cuttings

instead of dense sowings; increasing the frequency of thinnings; substituting immune species for *Dalbergia* on unsuitable soils or at epidemic foci; and introducing natural enemies into new plantations. The Cassidid, *Calopepla leayana*, Latr., a defoliator of *Gmelina arborea* that has two and a partial third generations a year, can be controlled by collecting the beetles during their prolonged period of hibernation.

Shoot borers and stem borers are the most important pests of pure crops, except in coniferous forests, during the first years of growth. *Hypsipyla robusta*, Moore, which bores in the shoots of toon (*Cedrela toona*) and mahogany (*Swietenia macrophylla*) may be sufficiently controlled by close stocking and overhead shade to prevent young trees from succumbing to its attacks. In the north, where this Pyralid passes two generations in flowers and fruits, elimination or sack banding of flowering trees in the neighbourhood of plantations helps to control heavy infestations. Among stem borers, which have annual life-cycles even in the tropics and are mostly polyphagous, the Hepialid teak borers, *Phassus malabaricus*, Moore, and *P. signifer*, Wlk., which have a great variety of food-plants among shrubs and young trees, may be controlled by cutting the undergrowth at appropriate periods in connection with the preparation of the area for regeneration; and Cossids of the genus *Zeuzera*, which appear in plantations of teak, sandal, *Casuarina*, etc., can be checked by similar methods. The Lamiid, *Dihammus cervinus*, Hope, which attacks teak and *Gmelina arborea*, can be controlled by the destruction near plantations of the shrub, *Clerodendron infortunatum*, from which it is derived. The Curculionid, *Cyrtotrachelus dux*, Boh., and the Hispid, *Estigmena chinensis*, Hope, which bore in growing culms of bamboo, can also be controlled by measures that are silviculturally desirable. Measures against *Celosterna scabrator*, F., on *Acacia arabica* have already been noticed [*cf. R.A.E.*, A **20** 209]. *Xyleutes ceramicus*, Wlk. (beehole borer) is the most serious menace to teak in Burma, trees of all ages being attacked throughout life. It is most injurious in pure plantations and where the average annual rainfall is between 60 and 90 inches. On account of its low population density, it cannot be dealt with by direct measures or improvement of parasite control, the only method being cessation of planting where rainfall is favourable to infestation. The measures against *Hoplocerambyx spinicornis*, Newm., on sal [*Shorea robusta*] [*cf.* **17** 115, 414] are probably the most effective and best organised of any devised for Indian forest protection. Serious outbreaks have only rarely occurred since those in central and northern India 10 years ago [**15** 354–356].

Damage to felled trees or logs by Longicorns, Buprestids and weevils can be entirely avoided by removing the bark. Damage by Platypodids and Scolytids is preventable by removal of the bark in some cases and by its retention in others, restriction of felling in certain seasons, storage under water, destruction of felling refuse, early conversion, etc. The protection of logs is chiefly dependent upon the correlation for each species of tree of the period of felling, method of extraction, and conditions of storage until conversion. In India, as in other countries, species of *Lyctus* and allied genera are the most serious pests of converted timber. Regular annual inspection and disposal of infested pieces is generally enough to keep sawmills and factories free from borers. Appropriate methods of stacking and antiseptic treatment will reduce liability to attack in the case of plywood, panels and planking.

Cutworms and cockchafer larvae are only injurious in mountain forest nurseries. The former are effectively controlled by clean weeding, and the latter by avoiding disturbance of the soil by weeding or preparation of beds just before the burst of the monsoon and for the following 6–8 weeks. If seeds are sown at this season, a covering of sand, charcoal dust or brushwood should be used as an obstacle to oviposition.

Glover (P. M.), Negi (P. S.) & Gupta (S. N.). **The Hosts of** *Eupelmus tachardiae* **How.**—*Curr. Sci.* **4** no. 1 pp. 37–39, 1 fig., 3 refs. Bangalore, July 1935.

In view of statements by Mahdihassan that *Eupelmus tachardiae*, How. (*Brasema annulicaudis*, Cam.) is a parasite of the larvae of the Noctuid, *Eublemma amabilis*, Moore, which is predacious on lac insects in India, the authors recapitulate published evidence that this Eupelmid is in fact an endoparasite of the lac insect (*Laccifer lacca*, Kerr) and an ectoparasite of the larvae of the Braconid, *Microbracon greeni*, Ashm. (*tachardiae*, Cam.), which attack *Eublemma* [*cf.* also *R.A.E.*, A **19** 650; **23** 86, etc.]. During the last 8 years the authors have never found it parasiting *E. amabilis* but have observed numerous cases in which it was parasitic on *M. greeni* and *L. lacca*. Moreover, a number of males and females of it have been reared from larvae and pupae parasitic on lac insects, and it was artificially reared in the insectary on larvae of *M. greeni* that had spun cocoons in small glass capsules, the life-cycle from egg to adult being completed in from 16 days beginning in July to 64 days beginning in December.

Jepson (F. P.). **Report on the Work of the Division of Plant Pest Control.**—*Adm. Rep. Dir. Agric. Ceylon 1934* pp. D104–D124. Colombo, 1935.

An account is given of routine work connected with the declared pests of tea, coconut and banana in Ceylon during 1934. Of the tea pests, *Xyleborus fornicatus*, Eichh., is spreading gradually, infestation by *Homona coffearia*, Nietn., has decreased in 10 districts in which it was previously severe, although it has increased in 5 others, and nettle grubs (Limacodids) although injurious in one district only, were more numerous there than in 1932 or 1933. Larvae of *Phyllognathus dionysius*, F., and *Oryctes rhinoceros*, L., were found together in green manure around the base of young coconut palms that had been severely damaged by the latter. So far as is known *Phyllognathus* causes no injury to coconut. Drought increased the infestation of coconut by *Nephantis serinopa*, Meyr., in the Eastern Province but it was completely absent in the North-Western Province. There were no serious outbreaks of *Rhynchophorus ferrugineus*, F., on coconut, or of *Cosmopolites sordidus*, Germ., or *Odoiporus longicollis*, Ol., on banana, and bunchy-top of banana, transmitted by *Pentalonia nigronervosa*, Coq., was not unusually prevalent.

Special investigations on termites are generally reviewed, including work in progress on bionomics and tests of the resistance of building materials treated with proprietary preparations for which repellent properties are claimed. Notes are also given on advisory work, with a few records of infestation of living plants. Injection of Paris green for the control of *Calotermes* (*Neotermes*) *militaris*, Desn., in tea bushes

[*cf. R.A.E.*, A **21** 362] continued to give satisfactory results, and the same treatment was recommended against *C.* (*Glyptotermes*) *dilatatus*, Bugnion & Popoff. Both termites also infested *Albizzia* planted with tea, and it became evident that treatment should be extended to these trees. Paris green caused injury to tea bushes when injected into sound wood that had not been attacked by termites. Many nests of mound-building termites were successfully treated with petrol [*cf.* **19** 336].

JEPSON (F. P.). **Report on the Work of the Entomological Division, 1934.**—*Adm. Rep. Dir. Agric. Ceylon 1934* pp. D132–D147. Colombo, 1935.

Pests occurring in Ceylon during 1934, apart from some mentioned in other reports, etc. [*R.A.E.*, A **21** 361 ; **22** 683 ; **23** 49, 72, 638], included *Heterusia cingala*, Moore, *Zeuzera coffeae*, Nietn., *Tetranychus bioculatus*, W.-M., *Notolophus posticus*, Wlk., and *Dasychira thwaitesi*, Moore, on tea. Coconut palms were injured by *Aularches miliaris*, L., and *Aspidiotus destructor*, Sign., which was widespread owing to the drought and the shortage of the predacious Coccinellid, *Chilocorus nigritus*, F. Ceylon tea arrived in Canada infested by Psochids, and *Oryzaephilus* (*Sylvanus*) *surinamensis*, L., was found in exported desiccated coconut, but in neither case could the source of the infestation be found. Rice was attacked by *Spodoptera mauritia*, Boisd., which was controlled by flooding the fields, *Marasmia bilinealis*, Hmps., which was heavily parasitised, *Borolia venalba*, Moore, *Parnara bada*, Moore, and *Leptocorisa varicornis*, F.

Fruit pests included : *Coccus viridis*, Green, *Thosea recta*, Hmps., *Lepidosaphes beckii*, Newm., *Dasychira mendosa*, Hb., *Dacus ferrugineus*, F., *Saissetia coffeae*, Wlk., and *Papilio demoleus*, L., on *Citrus* ; *Rhynchaenus mangiferae*, Mshl., *Apoderus tranquebaricus*, F., *Idiocerus clypealis*, Leth., and *Bombotelia jocosatrix*, Gn., on mango ; *A. tranquebaricus* and *D. ferrugineus* on avocado (*Persea gratissima*) ; *Astycus immunis*, Wlk., on loquat ; the Nymphalid, *Atella phalantha*, Drury, on *Flacourtia inermis* ; and *Eriosoma* (*Schizoneura*) *lanigerum*, Hsm., on apple.

Vegetable pests included : *Dacus cucurbitae*, Coq., and *Pseudocophora bicolor*, Jac., on snake gourds (*Trichosanthes anguina*), and the former also on bitter gourds (*Momordica charantia*) ; *Riptortus pedestris*, F., and *Mylabris trigonalis*, Licht., on cowpeas ; *Urentius echinus*, Dist., on brinjal [*Solanum melongena*] ; and *Prodenia litura*, F., and *Crocidolomia binotalis*, Zell., on crucifers. *Dacus caudatus*, F., was reared in tomatos ; the egg, larval and pupal stages lasted $2\frac{1}{2}$, 9–15 and $11\frac{1}{2}$ days respectively. Tobacco was attacked by *Phthorimaea heliopa*, Lw. [**22** 624] and *Prodenia litura*.

Pests on shade trees and green manure and cover crops included : *Taragama dorsalis*, Wlk., *Terastia meticulosalis*, Gn., *Pseudococcus citri*, Risso, and *Notolphus posticus*, Wlk., on dadap ; *Coccus viridis* and *Aphis gossypii*, Glov., on *Gliricidia maculata* ; adults of *Anomala dussumieri*, Blanch., on *Albizzia* ; *Stauropus alternus*, Wlk., on *Acacia decurrens* ; *Argina argus*, Koll., on *Crotolaria semperflorens* ; *Utetheisa pulchella*, L., on *C. juncea* ; *Lamprosema diemenalis*, Gn., which was controlled by *Bactromyia fransseni*, Baranov, on *Pueraria phaseoloides* ; and *Ferrisiana* (*Pseudococcus*) *virgata*, Ckll., on *Leucaena glauca*.

Cardamom was injured by *Aularches miliaris, Lampides elpis*, Godt., and *Dichocrocis punctiferalis*, Gn., and pepper (*Piper nigrum*) by *Thosea cervina*, Moore. *Lasioderma serricorne*, F., attacked stored ginger for the first time on record in Ceylon. *Croton tiglium* was infested severely by *Saissetia nigra*, Nietn., and by *Amyna punctum*, F., which was controlled by lead arsenate sprays. Coffee was attacked by *Euproctis* (*Nygmia*) *flava*, Brem., for the first time. *Achaea janata*, L., occurred on mustard, and *Zeuzera coffeae* was reported to have injured *Casuarina equisitifolia* and *Cassia grandis*. *Aporosa lindleyana* and *Cassia bicapsularis* were damaged by *Cyclosia panthona*, Cram., and *Nephopteryx paurosema*, Meyr., respectively, both new records. Some reduction in the casts of *Gymnogryllus humeralis*, Wlk., which caused extensive injury to lawns, golf courses, etc., was effected by spraying the grass with 1 oz. lead arsenate in 2 gals. water.

Details are given of satisfactory results obtained in work on the introduction and distribution of broods of lac (*Laccifer lacca*, Kerr). Inoculations were successful on *Schleichera trijuga, Zizyphus jujuba*, and *Pithecolobium* (*Enterolobium*) *saman*, but not on *Erythrina lithosperma, Gliricidia maculata* or *Hevea brasiliensis*. Insects destructive to the brood were *Eublemma amabilis*, Moore, *Holococera pulverea*, Meyr., and the parasites, *Tachardiaephagus tachardiae*, How., *Parechthrodryinus clavicornis*, Cam., and *Tetrastichus purpureus*, Cam.

CORBETT (G. H.). **Division of Entomology. Annual Report for the Year 1934.**—*Gen. Ser. Dep. Agric. S.S. & F.M.S.* no. 21 pp. 43–56. Kuala Lumpur, 1935.

Many of the pests observed in Malaya during 1934 have already been noticed [*R.A.E.*, A **23** 57, 401, 440, etc.]. In October leaflets of a coconut palm bearing empty puparia of a Tachinid, probably *Ptychomyia remota*, Aldr., were received from Labuan. They may have been the progeny of parasites liberated there in 1924, 1932 or 1934 against *Artona catoxantha*, Hmps. Outbreaks of *A. catoxantha* were reported from three localities, but it disappeared from one after a period of heavy rains and high winds. Comparison of yields of nuts from uninjured trees and trees defoliated by it in 1932 indicated that although the yield may be considerably reduced in the year following defoliation, it may increase in the next year to such an extent as to show no loss in yield over the 3 years. Other pests of coconut included *Melanitis harterti*, Honrath, which is recorded for the first time on coconut in Malaya, *Hidari irava*, Moore, which was reported from 3 localities in July, and *Oryctes rhinoceros*, L., which was prevalent in one area, and was found breeding in dung.

Tirathaba fructivora, Meyr., lays its eggs on the female inflorescences of the oil palm [*Elaeis guineënsis*] when the enveloping sheath commences to split. The larvae feed upon and sometimes bore into the flowers even before they are receptive. The apices are ringed and holes made in the pericarp of the fruits, and often the kernels are destroyed. As all the fruits of a bunch do not develop, this insect does not materially affect the yield. The collapse of the central spear of oil palm, which has been attributed to bud rot following the entry of fungi and bacteria into tissue injured by *O. rhinoceros*, is also caused by *Coptotermes* sp. Examination of palms showed that this termite was most generally responsible for the crinkled, dwarfed and malformed leaves and for the collapse of the central spear of leaves. In some

felled trees it was evident that the termite had entered through the roots and could be traced up through the trunk to the leaves. *O. rhinoceros*, which was abundant on one estate, was found breeding in the rotted stumps of rubber trees that had been felled to make way for oil palms. The larvae of *Thosea bisura*, Moore, and of *Telicota palmarum*, Moore, the Flatid, *Salurnis marginellus*, Guér., and the Derbid, *Rhotana* sp., were also observed on the leaves.

The larvae of *Phaonia corbetti*, Malloch, which enter the peduncle of the female flowers of nipah palm [*Nipa fruticans*] by way of the male flowers, causing either a reduction in the yield of juice or the death of the female flowers, can be controlled successfully by removing the male flowers. In addition to the plants mentioned in last year's report [**23** 57], *Phthorimaea heliopa*, Lw., refused to feed on *Capsicum* sp., *Datura* sp. or sweet potato. Solutions of carbolic acid, formalin and a proprietary compound injected into tobacco plants against the larvae injured the plants, and a 1 per cent. solution of the proprietary compound did not control the larvae. Cutting out the larvae with a knife is more effective and less injurious to the plant. An unidentified Braconid was reared from the larvae of this moth.

Termites attacked weakened tea bushes that had died back, by making runs on the outside of the stems to reach the dead parts. *Parasa lepida*, Cram., *Dasychira mendosa*, Hb., *Zeuzera coffeae*, Nietn., and *Lawana conspersa*, Wlk., were recorded on lowland tea, but were not very injurious, and *Helopeltis* sp. damaged highland tea in September. *Albizzia moluccana*, which is generally grown in the lowlands as shade for tea, is occasionally entirely defoliated by *Terias* (*Eurema*) *hecabe*, L., and the Psychid, *Mahasena corbetti*, Tams.

The only important pests of coffee were *Stephanoderes hampei*, Ferr., and *Cephonodes hylas*, L., but the Geometrid, *Hyposidra talaca*, Wlk., and *P. lepida* were present on it in some localities. *Brachytrypes portentosus*, Licht. (*achatinus*, Stoll.) was controlled on the seedlings by spraying with lead arsenate. *Microtermes pallidus*, Hav., was observed associated with dead and dying branches, and *Z. coffeae* was occasionally found burrowing in the stems. The Aphid, *Toxoptera aurantii*, Boy., caused young leaves to wilt.

Diatraea auricilia, Ddgn., and *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.) were most abundant on rice between October and April. Tillers bored after the fourth month's growth showed little reduction in yield. The yield from rice planted in May and June in 1933 and 1934 was higher than for any other month, although that planted in June may show a comparatively high percentage of bored tillers as a result of the increase of egg-masses in October. November–February appears to be the least favourable period for planting. Although March is apparently the month when *Diatraea* and *Schoenobius* are most abundant, the yields for planting in that month are higher than for planting between November and February, possibly because the moths prefer to oviposit on older rather than on seedling plants. The Delphacids, *Sogata furcifera*, Horv., and *Nilaparvata lugens*, Stål (*sordescens*, Motsch.), attacked rice growing in running water. The larvae of a Languriid, *Anadastus* sp., bored into the internodes just below the inflorescences, causing white seedless panicles, and the Ortalid, *Poecilotraphera gamma*, Hend., was bred from the stems.

Pests of the leaves of *Derris* recorded during the year were *Anisodes obliviaria*, Wlk., *Maruca testulalis*, Geyer, *Hasora chromus*, Cram. (*alexis*, F.), *Spodoptera pecten*, Gn., *Orgyia turbata*, Butl., *Mahasena*

corbetti, *Aserica* sp., *Adoretus* (*Chaetadoretus*) *borneensis*, Kraatz, *Diapromorpha* (*Aspidolopha*) *bifasciata*, Ill., *Phytoscaphus triangularis*, Ol., *Apoderus corporaali*, Voss., *Corigetus* sp., and *Craniotectus corbetti*, Laboiss. Unidentified larvae were observed boring the branches.

A Hymenopterous parasite was reared from the eggs of the Coreid, *Dasynus piperis*, China, on pepper (*Piper nigrum*). *Helopeltis* sp. produced corky excrescences on passion fruit (*Passiflora laurifolia*). The damage caused by the larvae of *Dacus* (*Chaetodacus*) *cucurbitae*, Coq., which were found in tomatos in one locality, can probably be avoided by earlier picking. Pests of *Citrus* were *Citripestis sagittiferella*, Moore, which bores into the fruit, *Agrilus marmoreus*, Deyr., which mines under the bark, *Ochrochira rubrotincta*, Miller, which damages the young shoots, and *Phyllocnistis citrella*, Stn., which mines the leaves. The leaves of cacao on an experimental plot were attacked by *Apogonia cribricollis*, Burm., and *Pseudococcus* sp. Tubers of sweet potato were badly bored by *Cylas formicarius*, F., and the leaves were damaged by the larvae of *Psara submarginalis*, Swinh., and the Cassidid, *Metriona circumdata*, Hbst. Cabbages were attacked by *Plutella maculipennis*, Curt. *Xylopsocus capucinus*, F., was reared from the saplings and *Xyleborus mancus*, Bldf., from the trunks of mahogany (*Swietenia mahagoni*). Pests of jelutong (*Dyera costulata*) were *Margaronia marginata*, Hmps., which caused some defoliation, *Platypus lepidus*, Chap., which bored planks, *P. suffodiens*, Samps., which bored the wood, and *Batocera rubus*, L., which oviposits on those parts of the trees from which bark has been removed or on which it has died.

Attempts to propagate *Laccifer lacca*, Kerr [*cf.* **23** 58] on *Cajanus indicus* were unsuccessful. Controlled experiments with poisoned bait against the cutworm, *Agrotis ypsilon*, Hfn., were satisfactory. Amyl acetate and ethyl acetate did not attract the adults. The larvae of *Anomala aureola*, Hope, caused considerable damage to the roots of grass in one locality. Badly attacked plots were treated with lead arsenate, carbon bisulphide, and paradichlorobenzene, and those receiving the last named showed marked improvement in growth.

Woo (F. C.) & Hsu (S. K. T.). **A Review of the Study and Control of agricultural Insect Pests in China.** [*In Chinese.*]—*Spec. Publ. nat. agric. Res. Bur. China* no. 11, 50 pp., 5 pp. refs. Nanking, Minist. Ind., August 1935. Price $0·50. (With a Summary in English.)

A short account is given of the organisation of economic entomology in China, and the literature on the more important insect pests is reviewed.

Chu (Joo-tso). **Preliminary Notes on the Ichneumon-flies in Kiangsu and Chekiang Provinces, China.**—*Yearb. Bur. Ent. Hangchow* **4** 1934 pp. 7–32, 77 refs. Hangchow, 1935.

This is a list, with brief notes on the hosts and distribution, of 28 species and 1 variety of Ichneumonids and 27 species of Braconids that were bred from some of the important insect pests in Kiangsu and Chekiang between 1929 and 1934. Many are recorded for the first time from China. A list of the hosts arranged under their Orders, with the parasites that attack them, is appended.

Balachowsky (A.) & Mesnil (L.). **Les insectes nuisibles aux plantes cultivées. Leurs moeurs. Leur destruction. Traité d'entomologie agricole concernant la France, la Corse, l'Afrique du Nord et les régions limitrophes.**—2 vols. 27 × 21·5 cm. Pp. xvi + 1138; & xi + 1139–1921, 8 col. pls., 1369 figs. Paris, Établ. Busson, 1935–36. Price £2 13*s.* 4*d.* Postage, Great Britain, 8*s.*; abroad, 12*s.* (Sole Agents for the British Empire and U.S.A.: the Imperial Institute of Entomology, London.)

This comprehensive work is based on original observations by the authors and on an extensive study of the literature. Its object is to bring together the present knowledge of invertebrate pests (chiefly insects) of plants cultivated in France and the French possessions surrounding the Mediterranean. The bionomics of a large number of pests are discussed and recommendations for control are given, the work being of much wider interest than its restriction to the regions mentioned appears to suggest, in view of the cosmopolitan character of many of the pests involved, especially those of *Citrus*.

The first volume comprises 3 chapters, of which the first (pp. 3–627) deals with insects and mites attacking pip, stone and small fruits, *Citrus*, mulberry, olives, figs, dates and nuts, the second (pp. 631–735) with those attacking vines, and the third (pp. 739–1137) with various invertebrate pests of cereals and fodder grasses.

The second volume opens with chapter iv (pp. 1141–1457), which is devoted to insect pests of various vegetables, leguminous fodder crops, beet, mushrooms, hemp, hops, flax, willow, and poplar. Chapter v (pp. 1461–1620) deals with insects and mites attacking ornamental plants and flowers outdoors and in greenhouses; chapter vi (pp. 1623–1710) with polyphagous Melolonthids, Noctuids and Orthoptera; and chapter vii (pp. 1713–1754) with pests of stored grain and flour and measures that safeguard the grain from infestation. Chapter viii (pp. 1751–1861) comprises a detailed account of the properties, composition and preparation of stomach and contact insecticides and fumigants.

Both volumes contain many excellent and original illustrations, and a bibliography covering 28 pages and a subject index are appended.

China (W. E.). **On the Identity of *Lygus simonyi*, Reut., and *Lygus vosseleri*, Popp., in Kenya and Uganda.**—*Bull. ent. Res.* **26** pt. 4 pp. 427–428. London, December 1935.

An examination of the type material has shown *Lygus vosseleri*, Popp., to be a synonym of *L. simonyi*, Reut. This Capsid is a pest of cotton in Uganda, where it has hitherto been known as *L. vosseleri* [*R.A.E.*, A **22** 678, etc.] The common coffee Capsid of Kenya, erroneously recorded as *L. simonyi* [**20** 337, etc.], is here described from the male as *L. coffeae*, sp. n. Another species, which was taken on coffee in Kenya in 1932, is very similar in appearance to the true *L. simonyi* but has certain distinguishing characters. It is possibly the species that Poppius erroneously regarded as *L. simonyi* when he described *L. vosseleri*.

Hancock (G. L. R.). **Notes on *Lygus simonyi*, Reut. (Capsidae), a Cotton Pest in Uganda.**—*Bull. ent. Res.* **26** pt. 4 pp. 429–438, 1 pl., 4 refs. London, December 1935.

Experiments in Uganda in which *Lygus simonyi*, Reut., was fed on caged cotton plants confirmed the assumption that this Capsid causes

a loss of crop. It produces brown angular spots on the leaves, and these patches become dry and crack, giving a tattered appearance to the plant. The small apical buds become black and fall off, and the bolls, which are also spotted, crack and are eventually shed. The growth of the branches is retarded and the actual number of nodes appears to be reduced. The most serious damage was observed in two localities during very wet seasons, which encourage the growth of tall lanky plants. In the 1929–30 season, of two experimental plots of the same variety of cotton planted at the same time, injury was more severe on the one that had a slightly more gravelly soil. During 1933–34, plants growing on light soil, although rather small, showed excellent growth and *Lygus* was almost completely absent, whereas plants growing on experimental plots where the soil was much heavier and the rainfall higher were seriously damaged when young, though they afterwards outgrew the injury and produced the better crop. These plots had been deeply cultivated for a preceding crop. It was observed that plants growing close to the base of large termite hills in one locality never suffered severe damage and were unusually healthy, probably owing to better aeration and drainage. From observations made in 1934–35 there does not appear to be any simple correlation between differences in soil and climate and damage by *Lygus*, but there are indications that factors that produce much succulent vegetative growth are correlated with more severe attacks.

Adults resembling *L. simonyi* have been found on beans (*Phaseolus vulgaris*), *Cajanus indicus*, *Sorghum* and *Eleusine*. When nymphs from the last-named plant were transferred to cotton, typical damage to the leaf-buds was produced. A Braconid, *Euphorus* sp., was bred once from a nymph of *L. simonyi*. Eggs of the latter [recorded as *L. vosseleri*, Popp.] have only recently been found [*cf. R.A.E.*, A **23** 10]. In the laboratory they were laid in the succulent petiole of a very young leaf of *Vigna* [*cf.* **21** 302]. The period from egg to adult was 14 days.

Observations to ascertain the amount of shedding of bolls and buds caused by *Lygus* and other pests were carried out in experimental plots in Kampala between 1928 and 1931. It could not be determined whether the shedding of the buds was due to *Lygus*. The percentage loss caused by damage to young bolls by *Lygus* varied from 14·5 in 1928–29 to 26·2 in 1930–31. A further attempt to estimate damage was made by spraying some plants and not others. In most cases the results were negative, as either damage was not reduced or the control plots were not attacked. In 1933–34 in an experiment carried out by C. G. Hansford when only the tips of shoots, where the nymphs are most often found, were sprayed, damage was considerably less on treated plants, and the yield was 25 per cent. more than that of the controls. Examination of the numbers of individuals of *Lygus* present on the native plots showed that it was just as common as on the experimental plots.

HODSON (W. E. H.). **The Lily Thrips** (*Liothrips vaneeckei*, **Priesner**).—*Bull. ent. Res.* **26** pt. 4 pp. 469–474, 1 pl., 4 refs. London, December 1935.

The distribution of *Liothrips vaneeckei*, Priesn., which is a pest of lily bulbs, is discussed from the literature. It was first observed in England in Buckinghamshire in November 1933 in imported bulbs of

Lilium croceum and from then up to 1934 has been recorded on imported bulbs of four other species of lily. Although it has not been recorded on *L. regale* and *L. longiflorum*, it was reared successfully on these species in the laboratory. All stages of the thrips are briefly described. Aerial parts of the plant are not attacked. Lightly or recently infested bulbs appear superficially to be normal, but the scales of those more heavily attacked become flabby and the outer ones thin and papery. Unless the thrips population is very large, injury is not serious, and in the absence of other injurious organisms a bulb can sustain a considerable population for a long time. Infested bulbs, however, usually become invaded by other pests, which enter by the injured tissue and often reduce the bulbs to a handful of scales.

The thrips is gregarious, and all stages are usually passed between the bulb-scales. It normally overwinters in the adult and second instar larval stages from November to March. There are at least 4 generations a year and probably 7 under favourable conditions. Spread in the field appears to be very slow. The adults have not been observed to fly and could not be induced to do so. The adults and pupae only leave the bulb when it becomes extensively decayed, and then they remain in the soil near it. Adults are only found sparingly on the stems, and it was impossible to rear larvae on leaves and stems in the laboratory. In the store, so long as the temperature is low, migration only takes place from badly infested bulbs. At 55°F. and over, however, the thrips become very active. It is probable that infestation usually spreads in the store and in transit.

Data on the life-cycle are incomplete and refer only to temperatures between 58 and 65°F. Probably under normal conditions all stages are prolonged. The average durations of the egg, first instar larva, second instar larva, prepupal and pupal stages were 14, 9, 11, 2 and 8 days respectively. The average number of eggs laid by one female was 51. Females lived an average of 56 days and males 35. Pairing usually took place on the 5th day after emergence and egg-laying began about the 14th day. All stages became torpid at temperatures below 40°F., and the adult and second instar larval stages were prolonged. When other stages were subjected to low temperatures for long periods, mortality was high.

Fumigation with paradichlorobenzene is the best method of control. In preliminary experiments all the thrips and other pests present were destroyed and the bulbs were not injured. On a commercial scale, the fumigation is carried out in special gas-tight wooden boxes, having one removable side and containing a series of shallow, wire-bottomed trays arranged vertically, the bottom of each fourth one being backed with a layer of hessian. The boxes are housed at a temperature of 55–65°F. The bulbs are placed in single layers on the wired trays and crystals of paradichlorobenzene are spread evenly, at the initial rate of 3 oz. to 1 cu. ft. of space, over those backed with fabric. After each consecutive fumigation the addition of from one-sixth to one-fourth of the initial dose keeps the concentration at the desired level. At 58°F. large and medium-sized bulbs require fumigation for not less than 96 hours and small bulbs for 60 to 80 hours. Bulbs that have begun to shoot should not be fumigated. After being lifted from the soil, bulbs should be stored for a few days to allow any moisture present to evaporate before being fumigated. This method of fumigation can also be applied to narcissus, tulip and gladiolus bulbs.

Trägårdh (I.). **The economic Possibilities of Aeroplane Dusting against Forest Insects.**—*Bull. ent. Res.* **26** pt. 4 pp. 487–495, 2 figs. London, December 1935.

The present status of dusting from aeroplanes or from the ground against forest insect pests is reviewed from information obtained from the leading forest entomologists in Europe and North America in answer to a circular. The area of forest dusted and the pests against which dusting was carried out between 1925 and 1934 in Germany, Poland and Russia are shown in tables. During the last ten years about 250,000 acres have been dusted in Europe, aeroplanes being used twice as often as ground equipment. The toxicity to birds, mammals and bees of the arsenic in the dusts used is discussed and the rarity of cases of poisoning noted. In view of the tendency to find substitutes for arsenical dusts, the value of stomach and contact poisons is compared. In Germany various preparations containing a mixture of pyrethrum and rotenone have been used successfully in the past two years. The method of dusting in Germany, Poland, Austria and Czechoslovakia is compared with that in Russia, where the cost is reduced by dusting as soon as all the eggs have hatched and so using a smaller amount of insecticide. Calcium arsenite (70 per cent. As_2O_3) is used alone, the average quantity applied being about 7 lb. per acre, as against at least 44 lb. per acre of a dust containing 15 per cent. As_2O_3 in Germany. About 50–60 acres can be dusted during one flight in Russia, which is about 4–5 times as much as can be dusted by the German method. The area dusted in one day in Russia during 14–16 flights averages about 500 acres.

Between 1898 and 1902 *Lymantria monacha*, L., destroyed about 7,000 acres of spruce forest in Sweden, resulting in a loss of about £50,000. If aeroplane dusting could have been carried out in 1898 when only about 2,000 acres were infested, even at the cost of £1 per acre it would have been profitable. A small isolated outbreak that occurred in 1915–17 caused a decrease in growth of the trees and confirmed the view that spruce is attacked much more than pine. Outbreaks of *Bupalus piniarius*, L., are much more common in Sweden than those of *L. monacha*, and usually occur in the south-east, especially after a period of drought. Examination of a sample plot of pines in 1918 and 1927, which had been defoliated by an outbreak of *B. piniarius* in 1916–17 and subsequently attacked by the pine beetle [*Myelophilus piniperda*, L.], indicated that the effects of defoliation may last for several years, as about 28 per cent. of the remaining trees had died by 1927.

Methods of calculating the loss caused by insect attack, based on the decrease in growth of the trees, and the cost of aeroplane dusting are described. It is estimated that by the Russian method the cost of dusting is about 8*s*. per acre.

China (W. E.). **Hemipterous Predators of the Weevils** *Cosmopolites* **and** *Odoiporus*.—*Bull. ent. Res.* **26** pt. 4 pp. 497–498. London, December 1935.

Bugs recorded as predacious on *Cosmopolites* and *Odoiporus* in Malaya are the Cydnid, *Geotomus pygmaeus*, Dall., the Nabid, *Phorticus pygmaeus*, Popp., and the Capsid, *Fulvius nigricornis*, Popp., all attacking

eggs, and the Reduviid, *Physoderes curculionis*, sp. n., the adult male of which is described, attacking the larvae. All Cydnids, so far as is known, breed on the roots of plants, though the adults may often be found on the surface of the ground. The structure of the rostrum is not adapted to predacious habits, and it is unlikely that *G. pygmaeus* is normally a predator.

RUBTZOV (I. A.). **Phase Variation in non-swarming Grasshoppers.**—*Bull. ent. Res.* **26** pt. 4 pp. 499–524, 2 pls., 2 graphs, 24 refs. London, December 1935.

Field and laboratory studies in Siberia of *Chorthippus albomarginatus*, DeG., and of the species closely allied to it (such as *Aeropus sibiricus*, L., *C. biguttulus*, L., and *C. parallelus*, Zett.) show that in all of them there are parallel series of colour forms, which do not change during individual life, are not affected by changes in environment, are hereditary and agree with Vavilov's law of homologous series. Biometrical study of *C. albomarginatus* demonstrates that these colour forms differ in the elytron over femur ratio and in their dimensions, the mesophilous f. *viridis*, which usually appears singly, being larger than the more mobile f. *rubiginosa*, which occurs mainly in dry pastures and predominates among other colour forms at the times of mass outbreaks.

In addition to the above hereditary forms, all the species of Siberian grasshoppers studied exhibit non-inheritable variations in colour, biometrics and behaviour, depending on the conditions of breeding and corresponding to phase variations in swarming Acridids. Every colour form of *C. albomarginatus*, while preserving the characteristic pattern, occurs in a number of shades, the lighter ones of which are considered as ph. *solitaria*, and the darker as ph. *gregaria*. The phases differ biometically in the same way as in the swarming locusts ; moreover, ph. *gregaria* is more mobile and inclined to migrations than ph. *solitaria*. In the field the abundance of dark forms (phases *transiens* and *gregaria*) of *C. albomarginatus* varied directly with the density of population. When *solitaria* and *transiens* hoppers were bred in cages under crowded conditions up to 90 per cent. of surviving hoppers became typical dark ph. *gregaria*. Such results were obtained with all the colour forms studied, but were the most pronounced in f. *rubiginosa*.

It is concluded that in non-swarming grasshoppers the potential ability to produce phases is most pronounced in those species and races that, owing to their habits and the conditions of their habitats, are able to multiply in masses in restricted areas.

BARNES (H. F.). **Some new Coccid-eating Gall Midges (Cecidomyidae).**—*Bull. ent. Res.* **26** pt. 4 pp. 525–530. London, December 1935.

The new species described are *Dentifibula lacciferi* predacious on *Laccifer javanus*, Chamb., in Malaya ; *Coccodiplosis citri* on *Pseudococcus citri*, Risso, in South Africa ; *Schizobremia coffeae* on a mealybug on coffee in Uganda ; and *S. jujubae* on *Pseudococcus* sp. on *Zizyphus jujuba* in Mauritius. The other species recorded are *Triommata coccotroctes*, Barnes, predacious on a mealybug in Sierra Leone ; *Schizobremia* sp. on *Saissetia coffeae*, Wlk. (*hemisphaerica*, Targ.) in Jamaica ;

and *Lobodiplosis pseudococci*, Felt, on *Pseudococcus brevipes*, Ckll., in Hawaii, where the former was introduced in 1930 from Mexico and is now well-established. In view of Hall's record of *Diplosis* sp. attacking *Phenacoccus hirsutus*, Green, in Egypt [*R.A.E.*, A **10** 521], it is noted that *Diadiplosis indica*, Felt, was reared from larvae attacking *P. hirsutus* in India [**8** 473].

Le Pelley (R. H.). **Observations on the Control of Insects by Hand-collection.**—*Bull. ent. Res.* **26** pt. 4 pp. 533–541, 3 figs., 9 refs. London, December 1935.

The value of hand-collection as a means of controlling insect pests is discussed from the literature. An experiment on the control of *Antestia orbitalis* var. *lineaticollis*, Stål, on coffee by this method was carried out in Kenya. A block of 40 trees was selected and the 3 rows of trees surrounding them were heavily sprayed with a kerosene extract of pyrethrum to kill any bugs on them and prevent reinfestation of the experimental plot. Each tree was then hand-picked for 15 mins., and the numbers of each stage of the insect obtained from each tree were recorded. Five of the trees were then sprayed with pyrethrum extract. The next day the remaining 35 trees were hand-picked and then 5 of them were sprayed. This was continued until on the eighth day the last 5 trees were hand-picked and then sprayed. The results, which are represented graphically, show that the rate of increase of the percentage of the insects collected decreases as the work continues. The formula for the curve obtained may be expressed as $P=100\ (1-(V.e)^{-t})$ where P is the percentage collected of the total number present, t is the time spent collecting, and V is a coefficient that varies with the efficiency of collection under the prevailing conditions. In practice one careful experimental picking provides data for the calculation of the formula, which may be used to determine the cost of hand-picking any percentage. The applicability of the formula under different conditions is discussed. The results show that in theory all the insects present can never be obtained by hand-picking, and that in practice the cost of picking an adequate percentage is almost invariably prohibitive. It is probable that the results obtained will prove valid in other cases of hand-picking and that much of the expenditure on this method is unproductive.

Details are given of an attempt to control *Antestia* on 35 acres of coffee where collecting the insects by hand was carried on from January 1933 to March 1934, during which time nearly 2½ million insects were removed from the whole area and an average of nearly 100 from each tree.* This is the only case recorded in which the density of population of *Antestia* has become equivalent to a severe attack and has remained at this density for many months. It is suggested that the hand-picking contributed to this condition. When the density is about 1,000 to a tree overcrowding is an important controlling factor. It is possible that a tree under the conditions prevailing on the 35 acres could only support permanently about 200 individuals of *Antestia* and that the trees were not infested by more than this number because of the continual removal of insects.

* [The total cost of this work is given as "over 170 shillings," but we are informed by the author that the figure should be £170.—Ed.]

Williams (C. B.) & Milne (P. S.). **A mechanical Insect Trap.**—*Bull. ent. Res.* **26** pt. 4 pp. 543–551, 1 pl., 2 figs. London, December 1935.

Davies (W. M.). **A Water-power mechanical Insect Trap.**—*Op. cit.* pp. 553–557, 1 pl., 3 figs.

In the first paper, diagrams and a detailed description of the construction and installation in the field of a mechanical insect trap are given. It consists essentially of two long conical muslin nets, which have a diameter of 22 ins. at the mouth and are 4 ft. 6 in. long, fastened to the ends of a light framework about 12 ft. in diameter. This is free to rotate and can be raised and lowered so that the distance of the nets from the ground can be altered. In the mouth of each net is an electric fan with a diameter of 16 ins., which drives a rapid current of air into the net and at the same time pulls it forward so that the whole framework rotates horizontally round the central axis. The revolution of the fans causes the whole frame to rotate once in about 12 secs., and the nets to advance at the rate of about 3 ft. a second. The insects are drawn into the net chiefly by the inrush of air caused by the fan, but also to a lesser extent by the forward movement of the net. The trap, which costs about £12 to make, was operated with the nets at different levels, the lower one being just above the ground. The speed of rotation is little affected by light winds, although small variations are produced by gusts. Only a very small percentage of the insects caught are damaged in their passage through the fans, which revolve 1,200 times a minute. The numbers of insects caught during a period of 24 hours when the trap was running continuously and a period of 3 nights and 2 days are tabulated under their orders.

In the second paper, a description is given of the mechanical construction of a similar trap but modified in order to drive it by water-power. The water supply was obtained from a small stream. When there is no wind or when the wind velocity is below 5 m.p.h. the trap rotates smoothly at the rate of 5 revs. per min. It was primarily constructed to catch migrating Aphids and has proved very satisfactory. It costs about £5 to make.

Marshall (Sir G. A. K.). **New injurious Curculionidae (Col.) from Malaya.**—*Bull. ent. Res.* **26** pt. 4 pp. 565–569. London, December 1935.

The new species described are *Dermatodes cinchonae* from cinchona, *Rhynchaenus flavirostris* from the leaves of mango, and *Ceuthorrhynchus oleraceae* from the leaves of *Portulaca oleracea*, in Java; *Corigetus albizziae* from *Albizzia moluccana* and tea in Sumatra; and *C. corbetti* from various plants, including cassava (*Manihot utilissima*), *Derris* spp. and *Cinnamomum zeylanicum*, and *Nanophyes shoreae* from the seeds of *Shorea curtisi*, in Malaya.

Ferrière (C.). **Two Chalcidoid Egg-parasites of *Diprion sertifer*, Geoffr.**—*Bull. ent. Res.* **26** pt. 4 pp. 571–573, 2 figs. London, December 1935.

Descriptions are given of both sexes of *Tetracampe diprioni*, sp. n., from Sweden, and *Achrysocharella* (*Wolffiella*) *ruforum*, Krausse [*R.A.E.*, A **5** 281], from Czechoslovakia. Both these Eulophids are parasites of the eggs of *Diprion sertifer*, Geoffr. A key to the three known species of *Tetracampe* is included.

Krishna Ayyar (P. N.). **The Biology and Economic Status of the Common Black Ant of South India**—*Camponotus* (*Tanaemyrmex*) *compressus*, **Latr.**—*Bull. ent. Res.* **26** pt. 4 pp. 575–586, 2 pls., 2 figs. London, December 1935.

An account is given of the bionomics of *Camponotus compressus*, F., and the construction of its nest is described. It is one of the most abundant and widely distributed ants in south India, being found in both wet and dry situations and at elevations up to 4,500 ft., and causes injury indirectly to a large variety of cultivated and ornamental plants by its symbiotic association with various pests, which it fosters and protects in order to obtain the sweet substances they secrete. A list is given of the numerous insects (Homoptera and Lycaenids) with which it is associated, showing the plants on which they occur. In July 1934 a few plants of ragi (*Eleusine coracana*) that had a heap of loose earth at their bases showed signs of impaired growth. The earth round the roots had been excavated to depths of 8 or 9 ins., and colonies of the root aphis, *Byrsocrypta gallarum*, Gmel. (*Tetraneura ulmi*, DeG.), and *Camponotus* were present. The excavations had been made by the ants to shelter the Aphids and themselves. There were no permanent ant nests in the field but the adjoining dyke was teeming with ants. Each day the infestation spread to more plants, and by the beginning of August nearly all the plants were infested and also some in adjoining fields. Some of the plants wilted and died. The infestation was the heaviest for 14 years and caused an appreciable loss of crop. Any Syrphid larvae present, which are predacious on the Aphids, were caught by the ants. *Sorghum* (cholam) and maize were similarly injured by *Peregrinus maidis*, Ashm. (*Pundaluoya simplicia*, Dist.), which usually infests the shoots. It was attended by the ants, which excavated to a depth of 12–18 ins. round the plants, and in November and December 1933 the roots were found to be heavily infested by both these species and many of the plants died. Cotton was very badly infested by *Aphis gossypii*, Glov., in association with numbers of the ant. Only the shoots and leaves were attacked, but almost every infested plant had a mound of loose earth at its base, which sheltered swarms of worker ants. Coccinellid larvae fed on the Aphids, but the adults and those of *Chrysopa* sp. were caught by the ants. In August 1935 excavations nearly 1 ft. deep made by *Camponotus* and sheltering Membracid nymphs were noticed round the roots of *Cajanus indicus*. The shoots and buds of *Dolichos lablab* were infested with *Aphis laburni*, Kalt. (*medicaginis*, Koch) and *Ceroplastodes cajani*, Mask., and the pods were heavily attacked by larvae of *Catachrysops cnejus*, F. All were attended by the ants. Damage was very severe and in some cases all the crop was lost.

A few predators attacking *Camponotus* have been observed, including spiders and the common crow (*Corvus splendens*). Flooding the nests with water has little effect on the ants. Any methods of control would have to be applied on an extensive scale, as there are usually numerous nests in a heavily infested area. Crude oil emulsion mixed with irrigation water in an infested plot of ragi and also applied to roots of infested plants did not reduce the numbers of ants permanently. The number of worker ants was reduced by fumigating the nests with calcium cyanide dust, but it did not reach the queen and brood, which are at a depth of $2\frac{1}{2}$–$4\frac{1}{2}$ ft. A few nests were treated with carbon bisulphide on cotton wool placed inside exit holes and passages lower down. The

gas penetrated into the galleries and killed a large number of worker ants, but many escaped through other openings at varying distances from the nests. The best control was obtained by soaking the nests with a solution of potassium cyanide (1 oz. in 1 gal. water). A small part of a dyke bordering a heavily infested field of ragi was thoroughly soaked with the solution to a distance of 3 ft. on either side. Next day the passages were found to be filled with heaps of dead ants and many of the immature stages. Ants that returned to the nest were also destroyed. Potassium cyanide applied twice at an interval of 2 days to the base of a small tree, *Morinda tinctoria*, that was heavily infested with *Pulvinaria psidii*, Mask., *Coccus* (*Lecanium*) *viridis*, Green, and *Camponotus* was effective. The queens and the young stages were destroyed and the number of worker ants reduced. A few more applications would probably have given complete control.

MOTE (D. C.). **Tree Borers and their Control.**—*Circ. Ore. agric. Exp. Sta.* no. 110, 6 pp., 4 figs. Corvallis, Ore., February 1935. [Recd. December 1935.]

Brief notes are given on the bionomics of the Buprestids, *Chrysobothris mali*, Horn, and *C. femorata*, Ol., the Scolytid, *Xyleborus dispar*, F. (*Anisandrus pyri*, Peck), and the weevil, *Magdalis aenescens*, Lec., which occur as borers in various fruit trees in Oregon, but only attack injured or weakened trees and may therefore be controlled largely by improved methods of cultivation.

The Buprestids attack all ages and varieties of trees. The eggs are deposited singly in rough bark, chiefly during June and July. The larvae tunnel winding galleries, sometimes even into the heartwood and pupate in the following spring. Repellent washes, in which enough water is used to permit application with a brush or sprayer, are recommended, a particularly effective formula being: ½ bushel rock lime, 2 U.S. qts. rock salt, 2 lb. powdered casein, 2 lb. naphthalene flakes or crude carbolic acid and 3 lb. boiled rice made into a paste.

The adults of *X. dispar* bore in the sapwood of the trunks and branches and deposit eggs along the sides of the burrows. The larvae hatch in a few days and during May and June eat the ambrosia fungus growing on the walls of the tunnel. In July and August they transform to adults, which remain in their tunnels until the following spring, and then fly to other trees to tunnel and oviposit. These beetles only attack trees in the sour-sap condition in which the ambrosia fungus will thrive. Heavily infested branches should be cut out, but lightly infested ones may be painted in April or May with a wash of 3 gals. water, 1 gal. soft soap or fish-oil soap and ½ pt. crude carbolic acid.

The adults of *M. aenescens*, which attack apple and prune, feed on the foliage and blossoms of the trees in late April and May. The eggs are laid in holes gouged in the bark and hatch in late May. The larvae tunnel into the tree during the summer and transform in the following April. Dead and infested wood should be removed and the wounds painted with Bordeaux paste.

FLINT (W. P.) and others. **Entomology Investigations.**—*Rep. Ill. agric. Exp. Sta.* **47** (1933–34) pp. 137–162, 2 figs. Urbana, Ill., 1935.

An account is given of the work against insect pests in Illinois during 1933–34. Strains of maize resistant to the corn-borer [*Pyrausta*

nubilalis, Hb.] were bred (a table showing the results of tests), and infestation by corn rootworm [*Diabrotica longicornis*, Say] was found to be reduced considerably if maize was not grown on the same ground for more than 2 years in succession. The first generation of the chinch bug [*Blissus leucopterus*, Say], which caused serious losses to maize [*cf. R.A.E.*, A **23** 53, 329], bred mainly on barley. Damage by the corn ear worm [*Heliothis armigera*, Hb.] was reduced by 30–40 per cent. by dusting with calcium arsenate or calcium fluosilicate. The latter is less injurious to the maize silk.

The infestation of peaches by the oriental fruit moth [*Cydia molesta*, Busck] at harvest was 2–8 per cent., and more on the later varieties [*cf.* **22** 357]. *Macrocentrus ancylivorus*, Rohw., which had been liberated in 16 counties against this moth during the last 3 years was recovered from a number of localities, where parasitism was up to 35 per cent. The addition of zinc sulphate to the lead arsenate and lime sprays used on peach trees prevented injury to the foliage. In spraying apple trees against codling moth [*Cydia pomonella*, L.], the best results were given by 4 lb. lead arsenate and 8 lb. lime (Bordeaux in 2 sprays) per 100 U.S. gals. water, with $\frac{3}{4}$ per cent. dormant oil. The effect of the spray lasted longer when $\frac{3}{4}$ per cent. soybean oil was substituted for the dormant oil. Of non-arsenical sprays, one containing 1 per cent. summer oil emulsion and 0·125 per cent. nicotine sulphate was the best.

Raspberries were infested with rose scale [*Aulacaspis rosae*, Bch.], which may be controlled by a dormant spray, and 50 per cent. of the canes contained egg punctures of tree crickets [*Oecanthus*]. Strawberry crowns injured by the strawberry crown borer [*Tyloderma fragariae*, Riley] produced less than half as many runners as uninjured plants. The beds should be renewed after two crops have been secured, as infestation is very much higher in old beds.

Gladiolus thrips [*Taeniothrips simplex*, Morison] has caused considerable losses; some of the usual measures [*cf.* **23** 757, etc.] are recommended for its control. A good kill of *Phenacoccus gossypii*, Tns. & Ckll., and *Pseudococcus citri*, Risso, on chrysanthemum was obtained with little injury to the plants by fumigation with $\frac{1}{4}$–$\frac{1}{2}$ oz. sodium cyanide per 1,000 cu. ft. for half an hour at 70–75°F.; two applications with a ten-day interval were sufficient for *Phenacoccus*, but *Pseudococcus* required three. A dust of powdered glue applied after rain or hosing controlled the red spider [*Tetranychus telarius*, L.] on ornamental plants, and a spray of nicotine sulphate controlled *Dendrothrips ornatus*, Jabl., on privet. Mixtures of sugar and Paris green scattered thinly over the ground near houses infested with ants gave promising results.

Shropshire (L. H.) & Compton (C. C.). **Saving Garden Crops From Insect Injury.**—*Circ. Ill. agric. Exp. Sta.* no. 437, 55 pp., 27 figs. Urbana, Ill., June 1935. [Recd. December 1935.]

This paper contains brief notes on the bionomics of a large number of insect pests of vegetables in Illinois, arranged under their food-plants. The injury caused by each insect is described and methods of control are indicated. A special section deals with suitable insecticides and the conditions for applying them.

Mote (D. C.). **Control of the Western Peach and Prune Root-borer.**—*Circ. Ore. agric. Exp. Sta.* no. 109, 6 pp., 8 figs. Corvallis, Ore., February 1935. [Recd. December 1935.]

Most of this information on the western peach and prune root borer, *Aegeria* (*Sanninoidea*) *opalescens*, Edw., in Oregon, where it is one of the most serious pests of peach and prune, has already been noticed [*R.A.E.*, A **9** 163 ; **11** 13 ; **16** 106]. The eggs are laid in July and August and hatch in 10 days [*cf.* **9** 163 ; **16** 106]. Paradichlorobenzene kills 65–100 per cent. of the borers when applied at the rate of ½ oz. per tree 1–3 years old, ¾ oz. per tree 4–5 years old, and ¾–1 oz. per tree over 5 years old. The finely ground crystals are sprinkled on the levelled ground in a circle 2 ins. from the base of the tree and then covered with loose earth. If the temperature has been low or rain has kept the soil wet so that evaporation of the fumigant has been retarded, the mounds are removed after 4–6 weeks to avoid possible injury to the trees from prolonged exposure and replaced with fresh earth. Failing autumn applications, spring ones should be made as soon as the ground warms up to 55°F. Only borers below ground level are killed. No injury to the trees has been reported from Oregon.

Baerg (W. J.), Isely (D.) & Schwardt (H. H.). **Entomology.**—*Bull. Arkansas agric. Exp. Sta.* no. 312 pp. 34–38. Fayetteville, Ark., November 1934. [Recd. December 1935.]

During dry summers the strawberry crown borer [*Tyloderma fragariae* Riley] practically destroys new beds of strawberry plants in Arkansas. In normal seasons the damage is less, as the infested plant sends out runners before dying. The females oviposit from March to August and during this time further plants become infested. Larvae occur as late as November, but only adults overwinter. They emerge from July to October and are found throughout the year in the crowns of the plants and under leaves, as they survive until the following July or August.

In experiments on the rough-headed corn-stalk beetle [*Euetheola rugiceps*, Lec.], adults reared in 1933 oviposited between 1st June and 12th August 1934, mostly between 16th June and 18th July. The eggs hatched in 7–14 days (average 10·06 for 680). At the temperature of the insectary, at 81·5°F. and at 90·5°F., the numbers of eggs laid by 10 adults were 170, 249 and 247 respectively, and the oviposition periods were 17, 8 and 9 days respectively. The average larval period in different soils varied from 52·92 to 61·46 days. Limited observations in the field showed that the larvae did serious damage to maize in light, sandy soil. The pupal period was 9–56 days (average 23·35 for 214) and emergence started in mid-August and still continued in mid-October.

In cage experiments in Arkansas, uninfested rice yielded about 29 per cent. more grain than rice infested by the rice water weevil [*Lissorhoptrus simplex*, Say] [*cf. R.A.E.*, A **20** 415 ; **22** 498].

Very early varieties of cotton [*cf.* **22** 638] only benefited by 30·9 per cent. while late varieties gained by 120 per cent. from dusting against the cotton boll weevil [*Anthonomus grandis*, Boh.].

Baerg (W. J.). **Three Shade Tree Insects, II. Great Elm Leaf-beetle, Catalpa Sphinx, and Eastern Tent Caterpillar.**—*Bull. Arkansas agric. Exp. Sta.* no. 317, 28 pp., 17 figs., 32 refs. Fayetteville, Ark., May 1935. [Recd. December 1935.]

The history of the distribution and economic importance in the United States of *Monocesta coryli*, Say (great elm leaf-beetle), *Ceratomia catalpae*, Boisd. (catalpa sphinx) and *Malacosoma americana*, F. (eastern tent caterpillar) are briefly described.

In many localities in Arkansas during 1928–30 *Monocesta coryli* attacked red elm (*Ulmus fulva*) and to a less extent American elm (*U. americana*). Data given on the life-history in 1929 differ little from those already noticed [*R.A.E.*, A **18** 707]. In 1930 many adults emerged in mid-July, nearly 6 weeks later than in the previous year. Large numbers of eggs were laid till about mid-August but none was observed to hatch. Since then no traces of feeding or any stage of the beetle have been found. At no time during the season was mating observed. Perhaps the failure in reproduction was due to the extreme severity of the winter of 1929–30 or the prolonged drought of the summer of 1930.

C. catalpae attacks all the common species of *Catalpa*, which is its only food-plant. Individual trees, especially of *C. speciosa*, appear to be relatively immune in some localities. Trees growing on high ground in poor soil are rarely, if ever, attacked. *C. bungei* is the most often attacked. Trees may be defoliated and kept bare throughout the summer over a large area, but in the year following such an outbreak the moth may be absent altogether, probably because of the activity of parasites. Two complete generations and a partial third were reared in the insectary. The eggs were laid in masses of 8–822 on the lower surface of the leaves and the larvae had 5 instars. In 1932 adults emerged in an outdoor insectary between 23rd May and 18th June from pupae collected from the soil in October 1931. Eggs were laid between 30th May and 14th June, and the larvae hatched in 5–7 days and pupated after 14–40. The prepupal stage lasted 1–5 and the pupal 13–30 days. The adults of the first generation emerged from 10th July to 9th August, and began to oviposit on 14th July. The larvae pupated after 13–29 days. The pupal period lasted 21–32 days. The first adults of the second generation appeared on 29th August and the last on 12th October. Eggs were laid on 23rd and 24th September and hatched in 5 days. By 11th October, when the larvae were in the fourth instar, temperatures were so low that they ceased feeding and did not mature. In 1933 the species was scarce in the field, and as no adults were obtained from material reared in the laboratory in 1932 and 1933, the data on the life-history for 1933 and 1934 are incomplete. In 1933 a large percentage of egg masses of the second generation were parasitised by *Telenomus* [? *catalpae*, Mues. (*cf.* **23** 512)], and only 4 larvae hatched from 807 eggs. *Apanteles congregatus*, Say, which attacks the larvae, appeared to be abundant throughout most of the season. Infested trees may be sprayed with 1–1½ lb. lead arsenate in 50 U.S. gals. water or dusted with lead arsenate and hydrated lime (1 : 2).

M. americana is an important pest of fruit and shade trees, but wild cherry (*Prunus serotina*) is its preferred food-plant. In Arkansas wild cherry, plum, pear, apple, peach and hawthorn [*Crataegus*] are the plants most commonly attacked. The fully formed larvae overwinter

in the eggs, which are present on the twigs in masses of 238–598. The time of hatching in spring is correlated with the stage of development of the buds of the different food-plants. The first larvae were observed in the field on 6th March 1935. They construct silken tents round the twigs and have 5 instars, which required 15–23, 7–15, 8–9, 6–7 and 13–35 days respectively in the insectary in 1930. Pupation occurs in cocoons under stones, in débris, or in the deserted nests, etc. The earliest and latest dates of pupation recorded were 22nd April and 4th June 1930. The moths usually emerged about 25 days later, 23rd May 1933 and 24th June 1931 being the earliest and latest dates on which they were observed. In 1931 the first egg mass was laid on 6th June and oviposition continued till 19th June. In 18–26 days the larvae were fully formed in the eggs, in which they remain for about 8½ months. Since 1928 this species has been fairly abundant in spite of the activity of parasites and birds. In 1931 its natural enemies were unusually active. On fruit trees the larvae are killed by a spray of 1½ lb. lead arsenate in 50 U.S. gals. water, but spraying is not recommended unless it is necessary for other pests, as the tents can easily be removed and the larvae destroyed.

Saint Vincent. A Proclamation. The Plant Protection Ordinance, 1935.—*St Vincent Govt Gaz.* **68** no. 45 pp. 249–250. St Vincent, 2nd August 1935.

Lists are given of plants the importation of which into St. Vincent is prohibited in virtue of the Plant Protection Ordinance no. 14 of 1935 [*R.A.E.*, A **23** 559]. The following insects occurring in the Island are proclaimed pests within the meaning of the Ordinance : *Steirastoma depressum*, L. (cacao beetle), *Rhynchophorus palmarum*, L., *Strategus aloeus*, L., *Cosmopolitus sordidus*, Germ. (banana beetle), *Calpodes ethlius*, Cram. (arrowroot leaf-roller), *Diatraea saccharalis*, F., and *D. canella*, Hmps. (sugar-cane borers), *Alabama argillacea*, Hb. (cotton worm), *Dysdercus discolor*, Wlk. (*delauneyi*, Leth.) (cotton stainer), and *Platyedra gossypiella*, Saund. (pink bollworm). Proclaimed diseases include sugar-cane mosaic.

Quarantine Proclamation no. 5 P.—*Commonw. Australia Gaz.* no. 49, reprint 1 p. Canberra, 19th September 1935.

A list is given of insects, or groups of insects, the introduction of which into Australia is prohibited under the Quarantine Act 1908–1924 in view of the injury they are likely to cause to plants. The prohibition also applies to mites and ticks.

Quarantine Proclamations nos. 8 P & 9 P.—*Commonw. Australia Gaz.* no. 49, reprints 1 p. each. Canberra, 19th September 1935.

These Proclamations comprise lists of plants or parts of plants the importation of which into Australia is prohibited. In the second are included all sugar-cane and banana plants, exclusive of the fruit of the latter, grown in any country in which boring weevils of the genera *Sphenophorus*, *Cosmopolites* or *Rhabdocnemis* exist.

Quarantine Proclamation no. 10 P.—*Commonw. Australia Gaz.* no. 49, reprint 1 p. Canberra, 19th September 1935.

The removal into Western Australia of apples, pears and quinces from any other part of the Commonwealth is prohibited to prevent the introduction of the codling moth [*Cydia pomonella*, L.], and the removal into Western Australia and South Australia of grape vines from Queensland, New South Wales and Victoria is prohibited on account of *Phylloxera vitifoliae*, Fitch (*vastatrix*, Planch.). Restrictions are also placed on the movement of cotton plants, cotton seed or cotton lint [*cf. R.A.E.*, A **12** 76], and *Citrus* plants from certain northern parts of the Commonwealth.

Quarantine Proclamation, no. 11 P.—*Commonw. Australia Gaz.* no. 49, reprint 1 p. Canberra, 19th September 1935.

In order to prevent the introduction of *Cydia pomonella*, L., the importation into Western Australia of walnuts grown in or shipped from California is prohibited.

McCarthy (T.). **Insect Pests of Stored Grain. Their Prevention and Control on the Farm.**—*Agric. Gaz. N.S.W.* **46** pts. 9–10 pp. 499–502, 546–548, 15 figs. Sydney, 1st September–1st October 1935.

The bionomics of and damage caused by *Calandra oryzae*, L. (common grain weevil), *Sitotroga cerealella*, Ol. (Angoumois grain moth) [*cf. R.A.E.*, A **16** 224] and *Rhizopertha dominica*, F. (lesser grain borer), which are the most important pests of stored grain in New South Wales, are briefly described.

Grain is best stored in concrete, wooden or galvanised iron silos [*cf.* **22** 476]. Where these are not available, it should be kept in bags in sheds or barns or stacked in the open on a raised wooden platform or on timber dunnage. To minimise infestation the site for the stack and the inside of the shed or barn should be thoroughly cleaned up beforehand. If the timber dunnage has been used for stacking grain before, it should be dipped in boiling water, and as an additional precaution the ground may be covered with a layer, 2–4 ins. thick, of slaked naphthalene and lime (1 : 20). The walls of the shed or barn can be sprayed with a strong emulsion of kerosene containing 3 per cent. cresylic acid to destroy any stray weevils. The method of fumigating the stores with carbon bisulphide at the rate of 5 lb. to 1,000 cu. ft. of space is briefly described [*cf.* **16** 225].

Noble (N. S.). **The Woolly Aphid Parasite. Effect of Orchard Sprays on** *Aphelinus mali*.—*Agric. Gaz. N.S.W.* **46** pt. 10 pp. 573–575, 2 figs., 1 ref. Sydney, 1st October 1935.

In 1934, laboratory experiments were carried out in New South Wales to find the effect of certain orchard sprays on the emergence of *Aphelinus mali*, Hald., the parasite of *Eriosoma lanigerum*, Hsm. Of 150 Aphids examined in February, 1 contained an egg, 107 contained larvae and 42 pupae of the parasite, and 59 or 39·33 per cent. contained either mature larvae or pupae. Batches of heavily infested apple twigs were then sprayed, respectively, with miscible white oil (1 : 40), nicotine sulphate (1 : 600) combined with soap (1 lb. in 25 gals.) or miscible white oil (1 : 200), and lime-sulphur (1 : 35), and the parasites that emerged were counted. Two batches of twigs, A bearing 400 and

B 354 Aphids, served as controls. The Aphids on the treated twigs were not counted. More adults emerged from all the treated twigs than from B, and in some cases the number was larger than from either A or B. It is evident that the various sprays used had little or no effect on the emergence of the parasites, and the variation in numbers was probably due to differences in the number of Aphids present on the twigs. Of the 1,623 parasites that emerged, 1,453 did so during the first 7 days after spraying, but a few continued to emerge daily during the next 10 days. As in summer in the United States the pupal stage occupies 6–7 days [*R.A.E.*, A **13** 177], it is probable that most of the parasites that emerged were in the pupal stage at the time of spraying but that some of those in the larval stage were able to complete development and emerge as adults.

In orchards where the parasite is definitely established, it is possible that contact sprays applied in the summer will destroy a larger proportion of young unparasitised Aphids than of adult parasites and the ratio of parasites to hosts will be increased. The spraying tests showed that mature larval and pupal parasites within the dead bodies of Aphids are not destroyed, and their emergence later would further increase the ratio of parasites to hosts. Where the parasite has only recently been established, it is inadvisable to spray against other pests unless eggs have been laid by the parasites and the larvae produced are nearly mature. Sprays or dusts applied every few days to control a spring outbreak of *Thrips imaginis*, Bagn. [*cf.* **23** 727] would probably destroy most of the emerging adults of *A. mali* before they had laid eggs but would probably miss many of the Aphids on the stems. More parasites than Aphids would be destroyed, and an outbreak of the latter would probably follow. This was borne out in 1931 when a severe outbreak of thrips was followed by a marked increase in the number of *Eriosoma*.

In New South Wales the parasite overwinters as a mature larva within the body of the Aphid and pupates in the late winter and early spring. At pruning time the twigs should be removed from the immediate vicinity of the trees, to prevent unparasitised Aphids from crawling up the trunks, but kept to enable any parasites present to emerge.

LEVER (R. A.). **Annual Report of the Government Entomologist for the Year 1934–35.**—*Brit. Solomon Is. agric. Gaz.* **3** no. 3 pp. 2–4. Tulagi, July 1935. [Recd. December 1935.]

Some of the information contained in this report has already been noticed [*R.A.E.*, A **23** 361, 634]. Additional food-plants of *Amblypelta cocophaga*, China, are domestic beans and *Codiaeum*. An attempt to locate the Coreid on coconut flowers suggests an average distribution of 8 per cent. with a maximum of 70 per cent. An undescribed species of *Amblypelta* has been taken feeding on *Codiaeum* and cassava (*Manihot utilissima*) on Isabel Island, where *A. cocophaga* has not yet been recorded. *Oxya gavisa*, Wlk., was found feeding on leaves of rice in May.

SIMMONDS (H. W.). **Annual Report of the Government Entomologist for the Year 1934.**—*Ann. Bull. divl Reps Dep. Agric. Fiji 1934* pp. 12–16. Suva, 1935.

Routine trapping of the banana borer, *Cosmopolites sordidus*, Germ., in Fiji in 1932, 1933 and 1934 caught 1,038, 950 and 983 adult weevils

respectively, and many were taken before oviposition. Migration occurred mainly by flight. The predacious Histerid, *Plaesius javanus*, Er., introduced from Java in 1913 [*R.A.E.*, A **2** 507], has markedly reduced injury by the weevil on one island, and further liberations will be made on others. Parasitism of the eggs of the banana scab moth, *Nacoleia octasema*, Meyr., by two parasites reached 20 per cent. in October and then declined, but these parasites are of little value. *Meteorus trichogrammae*, Wlkn., was bred from larvae of *N. octasema* on banana and *Pandanus* flowers. The Javanese larval parasite, *Cremastus* sp., was bred and 6,030 females liberated [*cf.* **22** 307], but no recoveries were made later in the year.

In work on the biological control of coconut pests, *Erycia basifulva*, Bezzi, was released against *Tirathaba trichogramma*, Meyr. [*cf.* **23** 608] and became established, and a colony of the Javanese parasite, *Pleurotropis parvulus*, Ferr. [*cf.* **21** 360] was liberated in the hope that it would attack *Promecotheca bicolor*, Maulik, but was not recovered.

A severe outbreak of a mealybug, ? *Pseudococcus cocotis*, Mask., on young royal palms [*Oreodoxa regia*] was controlled by the native ladybird, *Archaioneda* (*Neda*) *tricolor*, F., and the introduced *Cryptolaemus montrouzieri*, Muls. Other pests included *Prodenia litura*, F., on *Colocasia antiquorum* var. *esculenta*; *Mictis profana*, F., on *Citrus* and other plants; *Brachyplatys pacificus*, Pall., on *Gliricidia maculata*; and the Pyralids, *Nymphula foedalis*, Gn., on *Torenia*, and *Macragonia scitaria*, Wlk., on *Cassia fistula*.

Dry conditions late in the year led *Liothrips urichi*, Karny, to attack the weed, *Clidemia hirta*, in wetter zones [*cf.* **23** 269].

Camus (J. S.). **Annual Report of the Director of Plant Industry for the fiscal Year ending December 31, 1934.**—103 pp., 20 pls. Manila, Philipp. Dep. Agric. Comm., 1935.

During 1934 great losses to various crops in the Philippines were caused by locusts, which infested 22 provinces. Poison dusts and baits have been found the most effective and cheapest methods of control. The eggs were destroyed by direct collection, flooding or ploughing the ground. Owing to the wide application of all available measures, the bulk of the infested area had been freed from infestation by the end of the year.

The most important rice pests were *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.), *Scirphophaga innotata*, Wlk., *Spodoptera mauritia*, Boisd., *Prodenia litura*, F., *Nymphula depunctalis*, Gn., and *Leptocorisa acuta*, Thnb. The larvae of *Leucopholis irrorata*, Chevr., caused much damage to sugar-cane in some districts; the infestation was reduced by thorough ploughing to expose the eggs and larvae and by collecting and killing the latter. In preliminary experiments, *Idiocerus clypealis*, Leth., and *I. niveosparsus*, Leth., on mango were successfully controlled by spraying with 0·4–0·5 per cent. soap solution at intervals of 3–4 days during the flowering period. Of the parasites introduced into the Philippines, only two, *Apanteles glomeratus*, L., and *Trichogramma minutum*, Riley, have been tested successfully in considerable numbers and liberated in various places. *T. minutum* was found to attack readily the eggs of *Papilio polytes alphenor*, Cram., on *Citrus* and those of *Cosmophila erosa*, Hb., on cotton. In addition to parasites, the toad, *Bufo marinus*, has also been introduced into the Philippines for insect control.

KONDO (T.). **Studies on the Distribution, Morphology and Control Methods of** *Gryllus mitratus* **Burm. and** *Acheta bimaculata* **De Geer, important Pests of Sugarcane in Formosa.** [*In Japanese.*]—*J. Ass. Sugar Cane Pl. Formosa* **13** no. 10 reprint 29 pp., 10 figs. Taichu, October 1935.

Gryllus mitratus, Hagenbeck, and *Acheta bimaculata*, DeG., are serious pests of sugar-cane in Formosa, particularly from July to September, devouring the young cane and buds. Descriptions are given of all stages of both species. *G. mitratus* has 3 overlapping generations a year at Tainan. Oviposition takes place at night, beginning 11–16 days after emergence and continuing for 19–45 days. As many as 776 eggs may be laid by a single female. The nymphs hatch in 9–38 days and mature in 55–188 after 9 or 10 moults. *Acheta bimaculata* has 4 generations a year near Tainan, and all stages are found throughout the year, but adults are very scarce in February and March. Oviposition begins 6–18 days after emergence, a female laying 340–1,440 eggs during 16–40 days. The nymphs hatch in 10–12 days from May to September and 31–32 in November and December. They mature in 40–73 days, or 100–130 if they overwinter, and moult 8 or 9 times. The Sphegids, *Liris aurata*, F., and *Notogonidea subtessellata*, Smith, carry off the nymphs of these and other Gryllids. A mite, *Trombidium* sp., is often found on these crickets, and they are occasionally parasitised by Nematodes of the genus *Gordius*. Poison baits containing a fluoride are very effective for control.

KOIDSUMI (K.) & SHIBATA (K.). **Notes on the Autecology of some Fruit-flies. (I) On the Melon Fly.** [*In Japanese.*]—*J. Soc. trop. Agric. Formosa* **7** no. 3 pp. 245–254. Taihoku, November 1935.

In Formosa cucurbits are much injured by *Dacus* (*Chaetodacus*) *cucurbitae*, Coq., and their export to Japan is prohibited except for watermelons, which are carefully examined in quarantine. Breeding was successful when the adults were fed on bananas or other fruit juices, and kept in well ventilated and shaded cages. The adults emerge from the pupae early in the morning, and have a preoviposition period lasting 1 month in summer, 2 in spring and autumn and 4 in winter. They die within 5 days when not supplied with food, and in a week when fed on water alone. They live about 83 days when fed on fruit juices and are most active at 20–25°C. [68–77°F.]. The eggs are laid under the skin of fruits, usually 5–10 in a mass, and a female produces about 200 eggs during life in spring and autumn. In captivity the eggs were laid on fruits of many plants other than cucurbits, but they did not hatch, or the larvae failed to develop, except in papaya. At Taihoku no eggs are laid in January and February, when the temperature is below 17°C. [62·6°F.]. Oviposition begins towards the end of March, but the optimum temperature for it is over 25°C. [77°F.]. The eggs hatch in 10 hours in summer and 24 in winter. It is probable that in northern Formosa the winter is usually passed by adults, since the eggs and larvae do not develop out of doors during this season, and the pupae are killed by submersion in water during the winter rains.

TAKAHASHI (R.). **On the Insect Galls in Formosa.** [*In Japanese.*]—*Kagaku no Taiwan* **3** no. 5 pp. 3–8. Taihoku, November 1935.

A general account is given of insect galls in Formosa. Litchee [*Nephelium litchi*] and *Citrus* are much damaged by Eriophyid mites.

The galls of *Melaphis chinensis*, Bell, which contain much tannin, are found in the mountainous regions of the north-east, but are not used at present. A large gall caused by a Cecidomyiid on *Miscanthus* is eaten by the natives.

TAKIZAWA (M.). **Insect Pests of Bean Cakes in Store.** [*In Japanese.*] —*Manshu no Nogyo* **7** no. 7 reprint 9 pp., 7 figs. Manchuria, July 1935.

Ten beetles and four moths were found in stored bean cakes at Tairen, Manchuria. They included *Tenebrio obscurus*, F., *Dermestes coarctatus*, Harold, which was abundant and very injurious, *Laemophloeus testaceus*, F., *Pyralis farinalis*, L., and *Plodia interpunctella*, Hb. The injury was more serious in the lower parts of the heaps, 10 per cent. of the cakes being sometimes damaged. Brief notes on all the species are given, and fumigation with chlorpicrin is recommended for control.

KUWAYAMA (S.). **On two Species of *Lema* injurious to agricultural Plants in Manchuria.** [*In Japanese.*]—*Kontyû* **9** no. 6 pp. 293–296. Tokyo, November 1935.

Lema oryzae, Kuwayama, is very injurious to rice in Manchuria, being found as far north as 44·3°N. Lat. *Lema tristis*, Hbst., which causes serious damage to *Setaria* (*Chaetochloa*) *italica* in southern Manchuria, is not found on rice.

IMAMURA (S.). **On the olfactory and visual Senses of *Anthrenus verbasci* L. (Dermestidae).** [*In Japanese.*]—*Bull. seric. Exp. Sta. Japan* **9** no. 1 pp. 1–21. Tokyo, September 1935. (With a Summary in English.)

The larvae of *Anthrenus verbasci*, L., cause great damage to the silk, cocoons and dried pupae of silkworms. In Tokyo the beetles begin to appear in mid-May and are found on fine warm days on the white flowers of various plants. In experiments they were indifferent to the flower scent of one of these plants (*Dianthus*) and repelled by that of others (including rose and *Chrysanthemum*), but were attracted by some colours, particularly light blue and white ; it is therefore concluded that they are attracted to the flowers by colour and not scent. They usually enter houses to oviposit, and lay eggs in sheltered places, but not necessarily on the food material of the larvae. The larvae are highly attracted by dried silkworm pupae, pupa oil and fish manure, the first being the most attractive, and scent plays an important part in enabling them to find food. They are also attracted to silk, dried fish, etc. They are repelled by camphor, naphthalene, paradichlorobenzene, liquid ammonia, alcohol and particularly geraniol.

KUMASHIRO (S.). **On some Experiments and Observations concerning *Oxya*.** [*In Japanese.*]—*Nogaku Kenkyu* **25** pp. 195–220, 1 pl. Kurashiki, November 1935.

In Okayama prefecture, *Oxya vicina*, Brunner, and *O. velox*, F., feed on rice and *Cyperus* and have one generation a year, passing the winter in the egg stage. The eggs of *O. vicina*, which is the more common,

hatch about the beginning of May and the adults occur from mid-August until the end of December. The nymphs mature in 61–79 days, usually moulting 7 times, but sometimes only 6 times in the case of males. The preoviposition period lasts a month and the female lays 1–8 egg-pods, containing an average of 46 eggs each. The eggs hatch in about 20 days at 27°C. [80·6°F.] and in about two weeks at 35°C. [95°F.]. The adults of *O. velox* emerge somewhat earlier than those of *O. vicina* and begin to oviposit in 24 days. One female lays 1–5 egg masses, each containing an average of 38 eggs. These hatch in 18–19 days at 27°C. [80·6°F.] and in 13 days at 35°C. [95°F.]. The nymphs mature in 60–70 days, moulting 5–7 times. These grasshoppers are polyphagous, but chiefly feed on Gramineae and Cyperaceae. When the eggs are kept in water for long periods, the rate of development and percentage of hatching is reduced, but they are little affected by cold and damp.

Malenotti (E.). **L'agricoltura contro gli insetti.** [Agricultural Methods against Insects.]—Med. 8vo, 323 pp., 44 figs., 200 refs. Rome, Ramo edit. Agricoltori, 1935. Price *Lire* 20.

This volume is a study of the reactions in the biology of insect pests produced by agricultural practices, and its title is warranted by the fact that insects are often interfered with rather than favoured by agriculture. The points dealt with are illustrated by examples of action on individual pests. They include the resistance of plants to insects owing to substances contained in the plants or to their state of growth following sowing at certain times, crop rotation, selection of seed, and methods of ploughing, draining, irrigation, manuring, harvesting, etc.

Melis (A.). **La tignola orientale del pesco** (*Laspeyresia* **o** *Cydia molesta* **Busck) in Toscana e alcune considerazioni sulla lotta naturale e artificiale contro di essa.** [The Oriental Peach Moth, *C. molesta*, in Tuscany and some Notes on natural and artificial Control.]—*Note Fruttic.* **14** (1936) nos. 1–4 preprint 48 pp., 10 figs. Pistoia, 5th December 1935.

In Tuscany *Cydia molesta*, Busck, has at least five generations a year, the fifth overwintering. Adults have been observed to emerge as early as April and as late as 3rd October. During the winter the author found immature larvae in apples and pears. They fed intermittently, spun their cocoons early in February and gave rise to adults. It is not certain if they had hatched from late fifth generation eggs or represented a sixth generation.

The most serious injury is that done to the fruits of peach, especially those maturing late. Injury to the shoots is negligible in full grown trees, but is of some importance in young ones. Indigenous natural enemies include *Trichogramma* sp., Ichneumonids, Braconids, and a Tachinid, *Ptychomyia selecta*, Mg., which is of some value, especially in June, but their combined action is insufficient. The Braconids, *Macrocentrus ancylivorus*, Rohw., and *M. delicatus*, Cress., have been introduced [*R.A.E.*, A **23** 183, 184]. From experiments the author concludes that the following measures should give useful results if

applied over a wide enough area : Trapping the moths in pans, preferably of white enamel, hung in the trees and filled with baits, of which bran (4 lb. in 5 gals. water) is the best, solutions of beet molasses coming next ; removal of infested shoots and fruits ; banding the trees with rags or corrugated cardboard ; and providing trap-trees attractive to ovipositing females, the best being young peach trees.

BURGESS (R.). **Experiments on the Preservation of Wool against harmful Insects.**—*J. Soc. Dy. Col.* **51** no. 3 pp. 85–89. Bradford, March 1935. [Recd. December 1935.]

The results are given of laboratory tests of the value of various products (chiefly proprietary) for protecting woollen textiles against larvae of *Tineola biselliella*, Humm., and of the Dermestid, *Anthrenus fasciatus*, Hbst. In the tests with *Tineola*, lasting protection was afforded by Larvex and certain Eulan products [*cf. R.A.E.*, A **21** 534, etc.]. It was shown, however, that complete freedom from damage may depend on the nature and manner of storage of the goods. If untreated fabrics were in close contact with the treated ones, the protective effect of the Eulan treatment was reduced, some damage being caused to the impregnated cloth. Temporary protection was obtained by the commercial application of sodium fluosilicate. In another experiment worsted cloth immersed for 30 minutes in a cold solution containing 0·5 per cent. of sodium fluosilicate on the weight of wool resisted attack by newly hatched larvae, which died 12 days later, though pieces of fibres were detached by biting. Fumigation with paradichlorobenzene killed all stages of the moth in a small confined space, but in bulk trials a dosage of 2 lb. in a sealed room of 1,000 cu. ft. capacity had no effect on the larvae. Complete control of all stages of the moth in small receptacles was also obtained by fumigating with sulphur. Effective protection was afforded by closed boxes lined with the heartwood of red cedar (*Juniperus virginiana*) ; the young larvae and many of the eggs were killed, and though older larvae attacked the wool and pupated, the resulting adults failed to oviposit. Moreover, newly introduced moths either died without laying eggs, or the eggs did not hatch.

In the experiments with larvae of *A. fasciatus*, effective protection was obtained from Eulan products, " Larvex," iron-chromium treatment and 5 per cent. pale mineral oil, and 5 per cent. oleic acid allowed only slight damage to take place.

SCHNEIDER (H.). **Recherches sur la biologie et les dégats des insectes suceurs parasites de la betterave sucrière et spécialement de la punaise** (*Piesma quadrata* **Fieb.**).—*Publ. Inst. Amél. Better. Tirlemont* **2** no. 5 pp. 167–187, 20 figs., 16 refs. Brussels, 1934. [Recd. November 1935.] (With Summaries in Flemish, German & English.)

This is a translation of part of a paper of which an abstract has already been noticed [*R.A.E.*, A **22** 667.]. A systematic list is given of the sucking insects that attack sugar-beet, showing the countries in which they occur. Published data on the principal ones, especially *Piesma quadrata*, Fieb., in Germany [**16** 591] are reviewed ; and their methods of feeding and the pathological symptoms they produce are described.

Leaf-curl produced by the attacks of *P. quadrata* and considered by Wille to be caused by a virus [*loc. cit.*] may be transmitted by grafting, but the disease does not become very severe and a typical " lettuce head " is not formed ; perhaps the graft does not take completely.

Decoux (L.) & Roland (G.). **Etude de la pégomye de la betterave en Belgique en 1933.**—*Publ. Inst. Amél. Better. Tirlemont* **2** no. 5 pp. 139–165, 5 figs., 12 tables, 12 refs. Brussels, 1934. [Recd. November 1935.] (With Summaries in Flemish, German & English.)

The study of *Pegomyia hyoscyami* var. *betae*, Curt., in Belgium [*R.A.E.*, A **21** 443] was continued in 1933. Details, mainly in graphs and tables, are given of its seasonal history in various localities, temperature records, rainfall, and the degree of parasitism.

Infestation of beet was generally very much less in 1933, owing to the cold and damp in early spring and parasitism. The attack by the third generation was negligible, probably owing to the drought that occurred in late August and early September. Parasitism averaged 3 and 14·5 per cent. in the second and third generations in 1932, and 4, 13 and 34 per cent. in the 3 successive generations in 1933, when climatic conditions favoured the parasites. The low degree of parasitism in the first generation in 1933 was mainly due to the precocious hatching of *Pegomyia*. Of the parasites observed in 1932 [**21** 325], *Opius fulvicollis*, Thoms., appeared most frequently ; in addition *O. ruficeps*, Wesm., and *Stilpnus gagates*, Grav., occurred in small numbers in certain localities. Further experiments confirmed the value of delayed thinning of the beets in limiting the development of *Pegomyia*, particularly when first generation eggs were numerous. Under the same conditions about 50 per cent. of the eggs were destroyed by brushing the leaves with a rotating brush [*cf.* **21** 325] in dry weather. In view of the slight damage sustained in 1933, direct control measures were unnecessary and attention was mainly directed to careful cultivation.

Decoux (L.) & Roland (G.). **Etude de la pégomye de la betterave en Belgique en 1934.**—*Publ. Inst. Amél. Better. Tirlemont.* **3** no. 3 pp. 121–130, 5 tables, 10 refs. Brussels, 1935. (With Summaries in Flemish, German & English.)

In Belgium *Pegomyia hyoscyami* var. *betae*, Curt., showed a further decrease in 1934 [*cf.* preceding paper]. Only the first generation did damage, up to 38 per cent. of the larvae being parasitised. The parasites observed were *Opius fulvicollis*, Thoms., *O. nitidulator*, Nees, and *O. spinaciae*, Thoms., of which the last was least numerous. Artificial breeding of these parasites under Belgian climatic conditions is extremely difficult.

As the result of tests in 1933 and 1934 it is concluded that soil treatment with a product containing sulphur against hibernating pupae is effective when it is introduced to a depth of about 4 inches and at the rate of about 1,340 lb. per acre in March. It was used alone in acid soil and mixed with 10 per cent. superphosphate in alkaline soil.

PAPERS NOTICED BY TITLE ONLY.

Commonwealth of Australia. Department of Health. Summary of Proclamations and the Regulations under the Quarantine Act 1908–1924 (Plants Division) in force on 19th September 1935.—22 pp. Canberra, 1935.

KUNKEL (L. O.). **Possibilities in Plant Virus Classification** [including a list of insect vectors].—*Bot. Rev.* **1** no. 1 pp. 1–7, 88 refs. Lancaster, Pa, 1935.

LEACH (J. G.). **Insects in Relation to Plant Diseases** [a review of the literature].—*Bot. Rev.* **1** no. 11 pp. 448–466, 79 refs. Lancaster, Pa, 1935.

COOK (M. T.). **Host Index of Virus Diseases of Plants.**—*J. Agric. Univ. P.R.* **19** no. 3 pp. 315–406. Rio Piedras, P.R., November 1935.

COOK (M. T.). **Index of the Vectors of Virus Diseases of Plants.**—*J. Agric. Univ. P.R.* **19** no. 3 pp. 407–420. Rio Piedras, P.R., November 1935.

ROWE (J. A.) & KNOWLTON (G. F.). **Studies upon the Morphology of** *Paratrioza cockerelli* **(Sulc).**—*Proc. Utah Acad. Sci.* **12** pp. 233–239, 1 pl., 5 refs. Provo, 1935.

TAKAHASHI (R.). **Notes on the Aleyrodidae of Japan (Homoptera), II–III.**—*Kontyû* **9** nos. 1 & 6 pp. 25–27, 279–283, 2 figs. Tokyo, May & November 1935. [*Cf. R.A.E.*, A **23** 241.]

SAKAI (K.). **Notes on some Scale Insects and Food-plants from Tanegashima.** [List of 27 Species.] [*In Japanese.*]—*Kontyû* **9** no. 6 pp. 297–300. Tokyo, November 1935.

LINDINGER (L.). **Neue Beiträge zur Kenntnis der Schildläuse (Coccidae).** [New Contributions to the Knowledge of Coccids; including changes in nomenclature.]—*Ent. Z.* **49** pp. 121–123, 135, 444. Frankfurt a.M., 1935–36. [*Cf. R.A.E.*, A **23** 48.]

BRITTIN (G.). **Notes on the Genus** *Coelostomidia*, **with Descriptions of one Species and Table for Identification.**—*Trans. roy. Soc. N.Z.* **65** no. 1 pp. 63–70, 4 pls., 6 refs. Dunedin, September 1935.

HALL (W. J.). **The Genus** *Tachardina* **(Lacciferidae, Coccidae) in southern Africa** [including 3 new species, 2 new varieties and a key].—*Bull. ent. Res.* **26** pt. 4 pp. 475–486, 7 figs. London, December 1935.

GOMEZ-MENOR (J.). **Notas Entomológicas. Un Coccido nuevo** [*Eriococcus amomidis*, sp. n., on *Amomis caryophilata*] **de la Republica Dominicana.**—*Rev. Agric. Com. S. Domingo* **27** no. 75 pp. 2152–2153, 1 fig. Santo Domingo, December 1935.

BALACHOWSKY (A.). **Sur une Diaspine nouvelle** [*Aspidiotus thymicola*, sp. n.] **du sud de l'Espagne (Hem. Coccidae).**—*Bull. Soc. ent. Fr.* **40** no. 16 pp. 233–236, 1 fig., 1 ref. Paris, 1935.

BALACHOWSKY (A.). **Sur une Cochenille nouvelle** [*Asterolecanium nevadensis*, sp. n.] **de la Sierra Nevada (Andalousie).**—*Bull. Soc. ent. Fr.* **40** no. 17 pp. 239–242, 11 figs. Paris, 1935.

Shinji (O.). **Key to Japanese Species of *Aphis* and Description of a new Species** [*A. sanguisorbae*, sp. n.]. [*In Japanese.*]—*Dobuts Zasshi* **47** no. 565 pp. 737–741, 1 fig. Tokyo, November 1935.

Tóth (L.). **Ueber die intracellulare Symbiose der Aphiden.** [On intracellular Symbiosis in Aphids.] [*In Magyar.*]—*Állat. Közlem.* **32** no. 3–4 pp. 143–151, 6 figs., 17 refs. Budapest, 1935. (With a Summary in German.)

Tóth (L.). **Beiträge zur Kenntnis der Aphidenspeicheldrüse.** [Contributions to a Knowledge of the Salivary Glands in Aphids.]—*Z. Morph. Oekol. Tiere* **30** no. 4 pp. 496–505, 8 figs., 23 refs. Berlin, 4th December 1935.

Hundertmark (A.). **Die Entwicklung der Flügel des Mehlkäfers *Tenebrio molitor*, mit besonderer Beruchsichtigung der Häutungsvorgänge.** [Development of the Wings of *T. molitor*, L., with special Reference to Moulting Processes.]—*Z. Morph. Oekol. Tiere* **30** no. 4 pp. 506–543, 31 figs. Berlin, 4th December 1935.

Schedl (K. E.). **New Barkbeetles and Ambrosia-beetles (Col.)** [descriptions of 14 new species.]—*Stylops* **4** pt. 12 pp. 270–276. London, 14th December 1935.

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CONTENTS.

CONTENTS—*cont.*

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